TY-NINTH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

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THE IRON AGE

DDUCTION -:- MANAGEMENT FEBRUARY 15, 1934 PROCESSES -:- NEWS

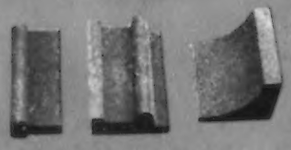
OUNCES OR TONS . . .

NRA MEMBER U.S. WE DO OUR PART


Hamburger Plates


Embossing dies for casket hardware


Sand Paper Slitter 1/8" x 5"


Liners for ceramic molds


Tin can cutting and forming rings

Machine Cams


Airplane Tail Skid


Cigar binder cutters


Radiator shell forming punch


Cowl forming punch

No matter what the weight or size of your die casting machine tool or finished product, our tool steels, cast to shape will meet your requirements.

Many industries are standardizing upon our cast to shape tool steels, because, no matter how difficult or complicated a need, our line includes the correct steel to meet it efficiently and economically.

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Ceramic	Cooking Utensil		Aircraft

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.. THE IRON AGE .. February 15, 1934 ..

NRA MEMBER U.S. WE DO OUR PART

Contents

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THE IRON AGE PUBLISHING COMPANY

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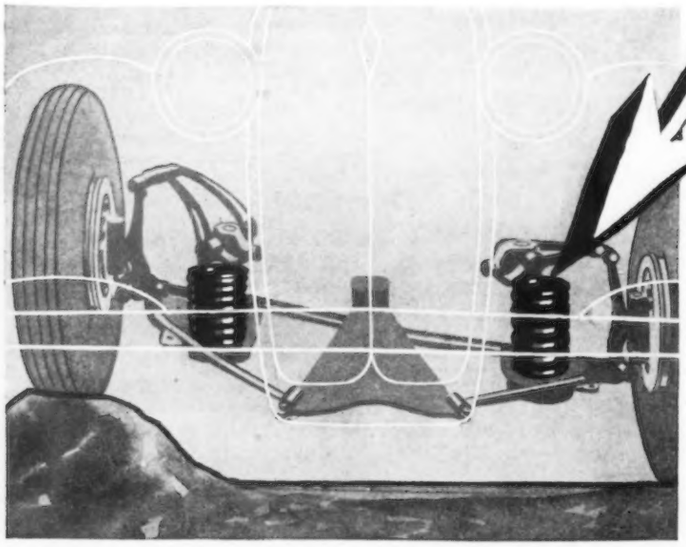
SEVENTY-NINTH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

EXPERIENCE

pointed the way!



THE never-ending process of evolution is constantly bringing new developments in automotive design. Many of these innovations require steels with special physical properties, or made with special attention to some characteristic.

The experience of the Bethlehem organization is of great value in meeting these new requirements. When a new problem arises, the solution is many times indicated by knowledge gained in making some one of the long list of Bethlehem products.

An example of this occurred in the recent shift to helical spring suspension on some makes of automobiles. Bethlehem over a period of years had devoted a great deal of study to the making of steel that would eliminate breakage in railway car coil springs. So, when the call came for helical spring steel, Bethlehem was in a position to supply it with full assurance of giving satisfaction.

Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL

BETHLEHEM *fine* ALLOY STEELS

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FEBRUARY 15, 1934

ESTABLISHED 1855

Vol. 133, No. 7

Spokesman or Valedictorian?

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ONE of the unfortunate and unfair concomitants of the New Deal is the stigma that is being cast upon enterprise. To be an employer of labor, a banker or a successful business man today tends to place one "on suspicion" in the public mind.

Opportunity is afforded, as never before, for every meddlesome trouble maker who carries a chip on his shoulder to publicly register his complaint and to gain a serious hearing.

Theoretically, this implied invitation to our disgruntled Toms, Dicks and Harrys to get their real or imaginary grievances "off of their chests" may be good political business. But, as it works out in practice, it tends to keep many able men busy defending themselves against false charges when otherwise they would be at their normal occupation of cultivating business, building employment and making a profit.

Another similar popular present-day political pastime, which is doing us no good because of the way in which it is being done, is the business of public muckraking.

Every pond has some muck on the bottom. If we can siphon off the muck without spoiling the water supply, well and good. Let's get rid of it. But to roil up the whole pond and keep it that way is not good practice. It is likely to poison the public.

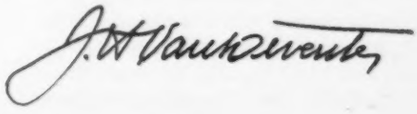
Unfortunately, the newspaper editor's test of news value, having to do with the man's biting the dog, unintentionally fits into the muckraker's publicity formula, which is to rush his charges into print and let their substantiation take its time. That is why ten dishonest bankers among ten thousand honest ones can pillory the entire banking business in the public mind. That is why one chiseling employer can cast suspicion upon a thousand Smiths and Jones who have labored honestly for years and kept their business houses clean. An ounce of black stirred into a thousand pounds of white is sufficient to discolor the entire public picture of business and industry.

THE vast majority of industrialists and business men and the executives who are associated with them are and have been doing an honest and constructive job, day after day and year after year. But their doings do not get into print, more's the pity.

Knowing the industry as we do, we are certain that the average employer and his assistants could safely stand comparison both as to purposes and achievements with our average statesman, collegiate brain truster, labor leader or social reformer. And that is putting it mildly, if the measure be the greatest good done to the greatest number.

Honest, constructive, conservative businesses and industries, the foundation of our National assets, are being misinterpreted to the public. And America is suffering from this misinterpretation through a lack of understanding, even in high places.

Industry needs, as never before, a spokesman who can interpret it to the public. If it does not find one, it may get a valedictorian.



Recent Economies in the Use of

A BY-PRODUCT of the depression has been the greater attention paid to fuel economies. This has resulted in better design of equipment, greater use of insulating materials, and in more scientific control.

Some of the methods used to secure greater fuel economy in the steel and metal-working industries are described in the accompanying article.

WHILE physicists may be speculating on the atomic energy contained in a spoonful of water as being sufficient to drive an Atlantic liner to Europe and back, the practical engineer is concerned with immediate and efficient utilization of available fuels. His efforts should be directed to convert as much as possible of the heat energy of fuel into useful work. Substantially 60 per cent of the known fuel deposits in the world are to be found in North and South America, but this is no excuse for not observing the fundamental principles of sound economy in fuel distribution and utilization. Constant improvement is being made in the operation of the several fuel consuming units, notably in blast furnace practice where daily tonnages in excess of 800 tons are not considered records, but much remains to be done.

The keystone of fuel economy in any composite plant is the blast furnace, which must be regarded not only as a producer of iron, but also as a producer of gas. Ideal fuel economy will be reached, when no coal other than that used in the manufacture of coke is used. To achieve this, means that the total of the blast furnace gas must be utilized to a greater degree of efficiency than present average practice, and that the maximum number of heat units contained in this gas must be converted into other forms of energy.

Present average blast furnace practice is to use all the surplus blast furnace gas, beyond that required in the stoves for heating the blast, under boilers for the generation of steam.

USE OF INSTRUMENTS IN

APPLICATION	PURPOSE	INSTRUMENT	RANGE
Blast pressure and volume recorder	To check pressure and volume of air delivered to the furnace	Recording	0-30 lb. pressure and volume in cubic feet
Hot blast pressure	To prevent channeling due to high pressure or formation of solid mass in center due to low pressure	Recording	0-32 lb. pressure
Top gas pressure	To show regularity of descent of burden	Recording	0-75 in. water
Stock levels	To determine depth of stock and movement of burden	Recording with long distance transmitter and recorder	6-0-24 ft.
Pressure of gas in primary and secondary dust catcher	To indicate obstruction	Two pen recorder	0-75 in. water pressure
Gas entering and leaving cleaner	To indicate obstruction	Two pen recorder	0-40 in. water pressure
Air pressure—cold air line	To check on blowing engine operation	Recording	0-25 lb. pressure
Pressure in clean gas mains at stoves	To check supply of gas to stoves	Recording	0-50 in. water
Gas washer water	To assure proper water supply	Recording	0-150 lb. pressure
Vacuum on turbo-blower condenser	To check efficiency of turbine	Recording	0-30 in mercury vacuum
Humidity of cold air	To determine moisture content of cold air for purpose of determining causes of changes in furnace operating conditions and correcting by possibly changing coke supply	Wet and dry bulb recording	-20-0-110° F.
Temperature inlet and outlet water and inlet steam on blowing engine condenser	To determine efficiency of condenser	Three pen recording	30-220° F.
Water entering and leaving bosh	For economy in regulating water supply	Two pen recording	40-225° F.
Water inlet and outlet gas washers	To determine amount water used per 1000 cu. ft. gas and to show obstruction	Two pen recording	40-225° F.
Gas temperature entering and leaving washers	To check up on thoroughness of washing and guard against too low temperatures; also to show obstruction	Two pen recording	40-250° F.
Temperature of gas leaving heat exchanger	To evaporate entrained moisture and add physical heat to fuel gas	Recording	40-400° F.
Incoming water to washer and outgoing gas	To be sure water is coming in contact with gas	Two pen recording	0-150° F.
Temperature superheated steam to turbo blower	For maximum efficiency of turbo blower	Recording	200-800° F
Chimney valve or waste heat temperature	To determine stove changes and operation	One to four pens recording	200-1000° F.
Temperature of hot blast	To keep uniform temperature in zone of fusion	Single or multiple indicating and recording	0-1600° F.
Automatic hot blast control	To regulate automatically hot blast temperature	Recording pyrometer with electric contacts	0-2000° F.
Temperature of top gas	To guide in charging	Indicating and recording	0-1100° F.
Chimney valve or waste heat temperature	To determine stove changes and operation	Recording	0-1100° F.
For furnace lining	To check up on heat distribution in furnace and wearing down of linings	Pyrometer indicator with switch	0-2000° F.
For temperature of foundation under hearth	To check depth of salamander	Indicating or recording	0-2000° F.
SINTERING PLANT			
Speed of sintering grates (in continuous process)	To check time during which dust is exposed to sintering flame	Recording tachometer	0-75 r.p.m.
ROLLING MILLS			
Motor load	To check efficiency and to guide in holding speed constant	Recording wattmeter or ammeter	As required
Speed of machinery	To guide in maintaining correct speed	Recording or indicating tachometer	0-150 r.p.m. or as required
Temperature of hot rolls	To increase life of rolls	Portable pyrometer	0-800° F.
OPEN-HEARTH			
Reversing valves	To show regularity in reversing valves	Electric time recorder	10, 15 or 20 min. time intervals
Reversing valves	To automatically reverse valves when checkers have absorbed sufficient heat	Pyrometer controller with motor	0-2500° F.

Fuels in the Iron and Steel Industry

By MARTIN J. CONWAY
Fuel Engineer, Lukens Steel Co., Coatesville, Pa.

THE STEEL INDUSTRY

APPLICATION	PURPOSE	INSTRUMENT	RANGE
OPEN-HEARTH—Continued			
Temperatures in checkers	To locate stoppages in checker passages	Portable pyrometer	0-2800° F.
Waste heat boilers	To indicate efficiency of heat exchange	Recording duplex pyrometer	0-1600° F.
Oil or tar lines	To guide in maintaining proper temperature for uniform viscosity	Recording thermometer	30-200° F.
Preheater	To condition oil or tar for flowing to burners	Recording thermometer	30-200° F.
Oil or tar lines	To guide in maintenance of proper pressure for flow required	Recording pressure gage	0-125 lb. or as required
Steam line to burners	To show sufficient steam pressure for atomizing oil and tar at burners	Recording pressure gage	0-125 lb. or as required
Gas lines	To check on pressure available	Recording pressure gage	0-50 oz. or as required
Base of stack	To analyze waste gases and indicate fuel efficiency	CO_2 recorder	0-15 per cent
Liquid fuel or gas lines	To indicate hourly fuel consumption and totalize for given period	Indicating recording integrating meter	0-400 gal. per hr. 0-12000 cu. ft. per hr, or as required
Flues from checkers	To indicate loss of draft through checkers or unbalanced condition	Indicating draft gage	0-2 in. water
Base of stack	To indicate stack draft and compare loss through flue or waste heat boiler	Draft gage	0-4 in. water
Roof of furnace	To indicate period or area of overheating on wear of roof where insulation is in use	Multiple recording pyrometer	0-2800° F.
SOAKING PIT			
Reversing valve	To show regularity in reversing valve	Electric time recorder	10, 15 or 20 min. time divisions
Reversing valve	To automatically reverse valves when checker work has absorbed sufficient heat	Pyrometer controller	0-2750° F.
Gas line	To check pressure available	Recording pressure gage	0-50 oz. or as required
Oil or tar lines	To guide in maintaining proper viscosity of fuel	Recording thermometer	30-200° F.
Preheater	To condition oil or tar for flowing to burners	Recording thermometer	30-200° F.
Oil or tar lines	To check pressure required to maintain flow	Recording pressure gage	0-125 lb. or as required
Steam line to burners	To show sufficient steam pressure for atomizing oil and tar at burners	Recording pressure gage	0-125 lb. or as required
Base of stack	To analyze waste gases to indicate fuel efficiency	CO_2 recorder	0-15 per cent
Fuel supply lines	To aid in fuel economy	Recording indicating integrating meter	0-100 gal. per hr. 0-10000 cu. ft. per hr. or as required
SHEET MILL			
Normalizing furnace	To record temperature in several zones	Multiple recording pyrometer	0-2000° F.
Normalizing furnace	To control temperature in several zones	Pyrometer controller	0-2000° F.
Normalizing furnace	To record temperature of sheets	Pyrometer recorder with optical thermocouple fixture	0-2000° F.
Box annealing furnace	To record temperature of furnace and temperature inside the box	Duplex recording pyrometer	0-1800° F.
Box annealing furnace	To preheat gas introduced in furnace or box to maintain reducing atmosphere	Pyrometer controller	0-1600° F.
Oil and steam lines	To check oil temperature and steam pressure	Recording thermometer and pressure gages	30-200° F. and 0-125 lb. or as required
Reheating furnaces	To check and control furnace temperature	Recording pyrometer controller	0-2000° F.
Hot rolls	To check roll temperature	Portable pyrometer	0-800° F.
Pickling bath	To record and control pickling bath temperature	Combination recorder and controller with electric steam valve	30-220° F.
Pickling bath	To guide in saving acid, speeding production and prevent pitting	Thermometer recorder	0-220° F.
Sheet and tin plate warehouse	To guide in prevention of rust	Psychrometer recorder	30-110° F.
Galvanizing bath	To check working temperatures and maintain required temperatures	Recording pyrometer controller	0-1100° F.
Tin bath	To maintain and record required temperatures	Recording pyrometer controller	0-800° F.
Tin bath and palm oil	To check temperature of the tin and oil	Recording two pen thermometer	0-800° F.
Liquid and gaseous fuel	To check and record fuel consumption	Indicating recording integrating meter	0-100 gal. per hr. 0-2000 cu. ft. per hr. or as required

In a few prominent exceptions it is used in gas engines for generating the blast required for the furnace or for the production of electricity.

Further Economies Possible

This surplus gas can and should be used for heating at the soaking pits, side door furnaces, and mixed with coke oven gas for melting at the open hearth. In other words, why manufacture producer gas with a consequent process loss of approximately 15 per cent when gas as such is already available, and why use blast furnace gas on boilers when greater efficiency can be obtained with solid fuel either stoker fired or pulverized.

Use of the Gas Engine

The fundamental basis of economy in the use of blast furnace gas is the gas engine, with exhaust heat recovery for both blowing and power generation purposes, its use resulting in a greater percentage of surplus gas becoming available for other purposes.

The installation of large modern gas engines for power production, combined with the complete and efficient utilization of this greater amount of surplus gas in the steel furnaces, accompanied by refinements in the design and operations of blast furnace stoves and heating furnaces, as well as the use of clean gas, is the direction in which fuel economy will be sought.

Mixtures of coke oven and blast furnace gases are used successfully in heating and melting operations, luminosity being furnished by the use of a small quantity of tar or oil where required. From this point of view of ultimate economy, steel plant engineers should be guided by the principle that blast furnace and coke oven gas be applied primarily to all uses where solid fuel cannot be utilized.

It is not economical to use blast furnace gas or coke oven gas under boilers, except as a relief valve for surplus, because coke breeze and the cheaper grades of fuel used in the

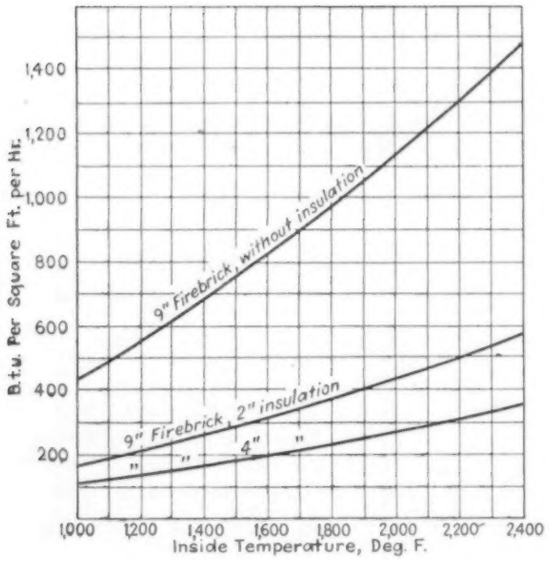


Fig. 1—The effect of insulation on heat losses through furnace walls is illustrated by these curves. A 9-in. firebrick wall was used to develop the data, and the comparison is between no insulation, a 2-in. insulation, and a 4-in. insulation with the air temperature in each case at 80 deg. F.

pulverized state, or on modern stokers, would give equally good results, while at the same time gasifying more expensive coal for use in heating and melting furnaces, for which purpose blast furnace gas mixed with coke oven gas could be employed to greater advantage. It must be borne in mind that the use of blast furnace gas and coke oven gas in melting and heating furnaces saves the cost of gasifying an equivalent amount of high priced coal.

A 50 Per Cent Surplus

In good blast furnace practice 25 per cent of the total output of gas is required for heating the blast. If gas engines are used for blowing and power generation, 18 to 20 per cent of the total gas output will be required for blowing and for miscellaneous power required by the furnace plant, as against 40 per cent with most steam installations. This leaves 50 per cent of the total gas as surplus in the case of the gas engine, and 30 per cent in the case of steam driven plant. This is after due allowance for gas loss in both cases.

The modern gas engine has been well developed, there being units of 11,000 hp. driving 8000 kw. generators, operating at nearly 40 per cent efficiency.

The cost of cleaning additional gas for the gas engine involves but a small extra cost, as it is fully realized in modern practice that the whole of the gas must be cleaned if the best results are to be obtained in other uses.

Waste heat boilers should be installed, where possible, to be operated in batteries, as at the open hearth plant, and there is a definite trend toward fire tube design for this work, because of their greater efficiency, since air infiltration is minimized and the tubes are easier to clean.

Improved regenerator and recuperator design are effecting economies of 100 per cent over previous practice and heating furnaces of all kinds are receiving their share of improved engineering thought.

Selecting the Fuel

Among the fuels commonly used in the open hearth process, probably the most interesting to the fuel engineer is liquid fuel, that is, coal tar or oil. Coal tar is not commonly used except where economic reasons force its use as a fuel, but the residual oils from refining operations can be used advantageously as open hearth fuels, either alone or mixed with gases. Fuel oil is usually purchased by the gallon, and for that reason the lower the Baume or the heavier the oil, the greater the calorific value per gallon.

The success of oil as an open hearth fuel depends on correct atomization, constant pressure and temperature, and intimate mixture of the atomized oil with the combustion air. The oil temperature required to produce the viscosity suited for correct atomization is seldom more than 160 deg. F.

Pulverized Coal

Pulverized coal permits of a wider range of fuels in a given installation. Coals with higher ash and moisture content can be used than on stoker fired installations. While comparatively new, pulverized systems have been the means of added impetus to improvement of design in stoker fired installations, with the result that gross efficiencies of close to 90 per cent are obtainable in some of the larger stations.

A marked reduction in the necessary furnace volume required for pulverized coal firing, has been brought about by air cooled and water cooled walls, together with increased turbulence within the furnace, with the result that while less than ten years ago the then efficient units liberated between 10,000 and 15,000 B.t.u.'s per cu. ft. of furnace volume per hr.; 40,000 to 60,000 B.t.u.'s are released in the average installation today, and the latest designs show liberations as high as 100,000 B.t.u.'s per cu. ft. per hr.

The secret of successful burning depends on the design of the combustion chamber or furnace. The increased investment of the powdered fuel plant over conventional stoker fired plants in some cases may afford a saving which will return the investment in four years.

The increased investment necessary for the conversion to powdered coal fired boilers where stokers are now used is obviously the amount of investment required to provide pulverizers, burners, and alterations to boiler furnace together with a sufficient sum to amortize the replaced stoker equipment. Where a new boiler furnace is being erected or a stoker entirely replaced, then the cost is simply the difference between the

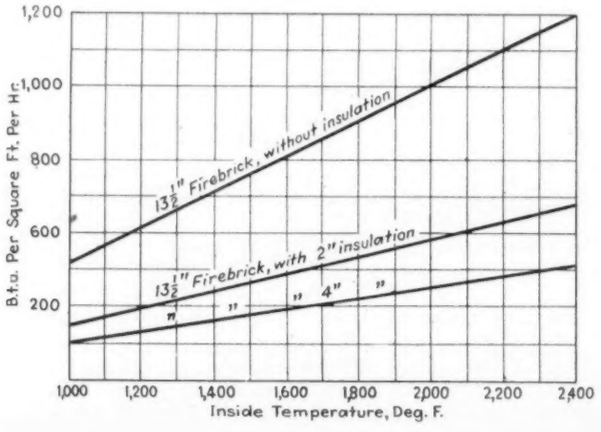


Fig. 2—The result of tests of heat loss, using a 13½-in. firebrick furnace wall, is here shown. The insulation and air temperature are the same as in Fig. 1.

new stoker and pulverizer equipment, which usually is small.

The successful application of pulverized coal firing to heating furnaces, malleable iron furnaces, and the like, already is well known.

Thermal Insulation

Within the last few years, the question of thermal insulating as applied to furnaces in which a high temperature is generated has received serious consideration, yet the magnitude of the fuel saving which thus can be effected has not been properly appreciated.

By use of suitable insulating materials, radiation losses can in most cases be reduced by 75 per cent. In the case of new open hearth furnaces or where flues are being changed to accommodate new valves, the flue walls are usually insulated with from 2 to 3 in. of the more common insulating brick. This applies to those furnaces where the waste gases are put to further heat exchange after leaving the checker chambers, as for instance, waste heat boilers or recuperators.

Plastic Coating Used

In cases where waste heat recovery is not practiced and where it would not be practical to excavate for flue insulation, the furnace is completely insulated above the cellar floor level to the roof of the furnace including checker chambers and roofs, slag pockets, and walls, back and front walls and furnace roof. This can now be done economically by the use of several materials on the market, chief of which seem to be a combination of slag wool, long asbestos fibre, and a suitable binding cement.

Usually this material is shipped to the job dry and is there mixed with water and put on in plastic form without the aid of reinforcing material as it adheres very well to clean brickwork. The usual thickness is 2 in. from the checker chambers to the roof. For the roof some modification is necessary. One design employs 3 in. of sand mixed with goulac or other binder. The savings accrue from both the prevention of heat dissipation and the stoppage of air infiltration, and amount conservatively to a 10 per cent fuel saving. One other benefit is the fact that a furnace can be shut down over the week end without damage to brickwork due to shrinkage, provided the doors are tightly closed, and in addition the furnace does not require the time or fuel to bring it up to working temperature as would be necessary if it were not insulated. Insulating of furnace bottoms is also beneficial, it being claimed that less bottom trouble occurs where insulation is used.

Curves showing heat dissipation through 9 in. and 13½ in. of fire-brick are shown in Fig. 1 and 2.

Colloidal Fuel

Coal and oil combinations unite the merits of both fuels, for the physical property of fluidity can be conferred upon solid coal when powdered and mixed as a colloidal amalgamation. In 1920 it was known to be possible to amalgamate no less than 55 per cent of triturated coal with oil. Fuels containing somewhat less proportions of coal have been successfully used.

The advantage of such fuel has long been known, for it is practically nonvolatile, the flash point being usually higher than that of ordinary fuel oils, the material showing no tendency to spontaneous ignition. Inasmuch as the specific gravity is greater than water, it can be readily quenched in case of fire and stored under water.

The mixture is homogeneous for several months in storage. A gallon of colloidal fuel contains more heat units than fuel oil. This is a consideration where minimum bulk is important. Colloidal liquid fuel contains nearly twice the amount of heat units per cu. ft. of fuel as does

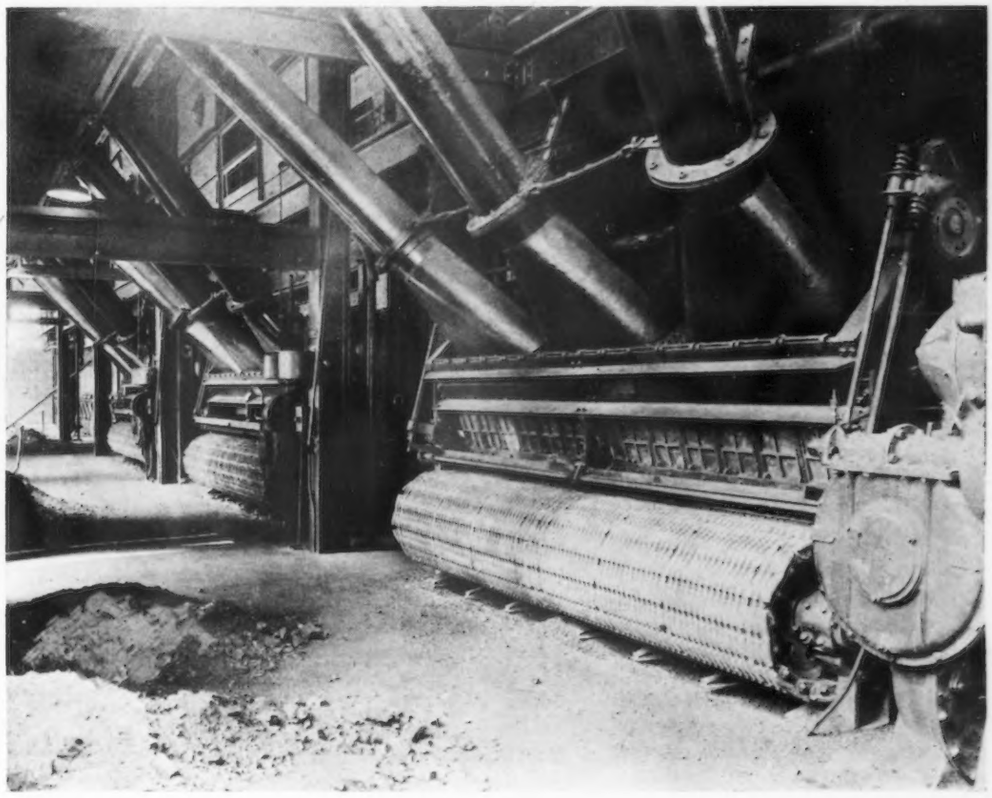


Fig. 4—This shows the efficient stoker installation at the blast furnace plant of the Mystic Iron Works.

powdered coal. It is one of those fuels which fit special needs only, as in most cases its cost is prohibitive on a straight heat unit basis.

Scientific Control of System

The first step toward the scientific control of a heat exchange system is the preparation of a heat balance including those items which can actually be measured. The remaining items should be calculated or estimated. From this proximate balance it will be possible to determine the relative importance of the factors which are not measured, and this will serve as a useful basis for the choice of instruments and measuring devices.

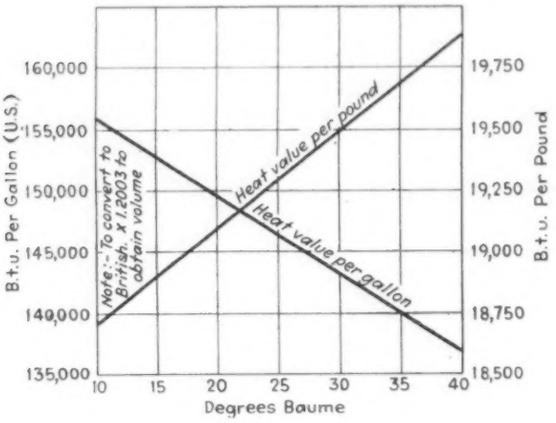


Fig. 3—Fuel oil is usually purchased by the gallon, and for that reason the lower the Baume or heavier the oil, the greater the B.t.u. content per gal., but these heavier oils are lower in B.t.u. value per lb., while the lighter oils have a greater B.t.u. per lb. but lower B.t.u. per gal. as shown.

A good illustration of scientific control of a heat exchange system as applied to the steel industry is the reversal of an open hearth furnace by checker temperature control. This is done two ways. Recording pyrometers are placed in the checker chambers or in the outlet flues from the checker chambers and when the temperature of checkers or outlet gases has reached a predetermined high point, a colored light is switched on to warn the operator that the furnace should be reversed, or the control may go one step further and actually reverse the furnace through suitable mechanism.

Some Examples of Economies

Fuel oil is finding many new applications in the metallurgical field. These include cupola operation, recuperative core drying ovens, new methods of carburizing, and the preheating of ladles. In the application of liquid fuels to heating furnaces generally, consideration is being given to mechanical injection such as now used extensively with boilers. The present necessity for economy is arousing general interest in fuels and fuel consumption and many furnaces are being scrutinized for possible new fuel application and improved design. Manufacturers are considering the recuperative principle wherever it can be properly applied in the construction of furnaces which obtain their combustion air at atmospheric temperatures.

In one particular type of oil-fired furnace for heating ingots and forgings, the fuel oil is preheated to within 20 deg. F. of its flash-point and is delivered to the burners at 75 lb. pressure. The air is passed through U-shaped calorized steel tubes, embedded in the air-preheating chambers, and thus is heated to 600 to 800 deg. F. Furnaces of this character require no stacks and, as combustion is quite complete, there is no smoke. In another case where oil is used for drying cores, car-type ovens are arranged in two batteries of five ovens each, and are individually heated by single burners firing into long combustion chambers beneath the ovens. This design gives uniformly baked cores with good fuel economy.

An interesting application of oil firing to cupolas has been made in a large foundry in Austria. Because of coke scarcity, three oil burners were built into the cupola and three corresponding tuyeres cut out. At starting, somewhat less than the usual quantity of coke is charged (510 instead of 540 kilos), and thereafter the quantity of coke added is 4 to 5 kilos per 100 kilos of metal tapped, while the oil consumption is 1 kilo per 100 kilos of metal tapped. The hourly rate of melting thus is increased by 30 to 50 per cent, with the tapping temperature fully maintained.

In the application of oil to furnaces formerly using other fuels, care must be taken in properly applying the liquid fuel to the new job. Some of the sad experiences in the past are due to the fact that insufficient thought has been given to such application, and as a result the new fuels have been used without making the necessary furnace changes, causing a loss in fuel economy.

Welded 18-8 Drums For Shipping Syrup

FOLLOWING a period of extensive research, the Coca Cola Co., Atlanta, Ga., has placed an order for 1000 stainless steel drums for use in shipping their syrup to bottling plants throughout the country.

A portion of the new containers, which will replace wooden packages, are now being fabricated by the Stevens Metal Products Co., Niles, Ohio, from low carbon stainless steel of 18-8 chrome-nickel analysis. A large share of the steel is Enduro, product of Republic Steel Corpn., Youngstown, Ohio.

Each of the new drums will be of 55-gal. capacity and resistance welded. Low carbon stainless was specified in order to avoid any possibility of corrosive action at or adjacent to the welds. All flanges and fittings will be of stainless steel, arc welded.

The Coca Cola company's choice of stainless steel for shipping containers followed its successful use of Enduro in dispensing units during the past year.

Agitator Drive Unit Built in Two Types

AN agitator drive unit has been placed on the market by the Patterson Foundry & Machine Co., East Liverpool, Ohio. This has been used on the company's line of mixing, agitating and stirring equipment, but has not been offered heretofore as a separate unit. The Unipower agitator, as it is designated, is built in both vertical and horizontal types. When using an 1800-r.p.m. motor shaft speeds down to less than 1 r.p.m. are obtainable, if desired, without the use of gears. It is stated that one-way or two-way agitation can be accomplished without noise or vibration, and that heavy continuous loads, or momentary overloads as high as 400 per cent, can be carried.

The units are compact and light, and are adapted for installation over tanks and vats. They are built in a number of sizes, from 40 hp. down to fractional horsepowers, and in several frame types. No additional bearings or flexible couplings are required for installation.

Potentialities of External Broaching

By JOSEPH GESCHELIN
Engineering Editor, Automotive Industries

PERHAPS the most spectacular applications of external broaching are those which are being developed for finishing very large flat surfaces such as the faces of cylinder blocks and the recessing of main bearing caps which, with the exception of the last operation, heretofore required large table or drum-type milling machines to meet the demand for productivity.

While it would be rather interesting to compare each of these applications on the basis of productivity, cost, quality of finish and tool life, with former methods, it is not possible for me to do so because such information is not yet readily available. However, I am able to make the comparison in one instance through the cooperation of Mr. E. J. Hunt, master mechanic, Plymouth Motor Corpn., who has provided complete details of its four external broaching operations.

Nos. 1, 2, 3, 4 Crankshaft Bearing Caps—Gray Cast Iron—Maxi Brinell 187

Broach joint face and ends to size, on Foote-Burt No. 1 duplex surface broach.

Tilting fixtures.

Part locked in place in fixture by lever operated cam.

Average surface broached 6.609 sq. in.

Average material removed 0.6212 cu. in. per cap.

Broaching production per hr., 398 caps, all caps.

Average caps per grind, 31,500.

No. 4 Crankshaft Bearing Cap—Gray Cast Iron—Maxi Brinell 187

Broach step in joint face for gasket, on a V-2 (12-ton) American Horning type hydraulic broach.

Fixture holds two caps in line horizontally.

Parts locked in place by quick operating screw with hand wheel.

Total surface broached 4.21 sq. in.—(2 caps).

Total material removed 0.221 cu. in.—(2 caps).

Production per hr. 772 caps (broach).

Average caps per grind—35,000.

Comparison with Milling

Milling production per hr. 231 caps (1st operation).

Milling production per hr. 200 caps (2nd operation) on No. 1-2-3 caps.

Milling production per hr. 60 caps (2nd operation) on No. 4 cap.

Connecting Rod—Drop Forged Steel—Brinell 228 to 255

Broach large end of rod to width over bolt bosses, on an Oilgear Sped. (12-ton) sideplate broach.

Fixture holds two rods in line—one above the other, parts locked in place with one lever.

Total surface broached 1.85 sq. in.—(2 rods).

Total material removed 0.087 cu. in.—(2 rods).

Production per hr. 490 rods broach.

Average rods per grind—21,600 rods.

Production per hr. 234 rods mill.

Cylinder Block—Cylinder Cast Iron—Brinell 170 to 207

Broach four bearing cap surfaces in bottom of block.

Fixture holds one block—block rolls into fixture off conveyor and is then lowered into place over two dowels. Then it is clamped in place.

Total surface broached 13.65 sq. in.

Total material removed 1.71 cu. in.

Production per hr. 112 blocks (broach).

Average blocks per grind—7000.

Comparison with Milling

Production per hr. mill 1st operation—15 per hr. per machine.

Production per hr. mill 2nd operation—15 per hr. per machine.

DEVELOPMENT of external broaching is capably and thoroughly reviewed by the author in a paper presented at the annual meeting of the S.A.E. at Detroit, Jan. 22 to 25.

Extracts from Mr. Geschelin's paper are presented in the accompanying article.

Broaches Are Sectionalized

On the basis of the data at hand I find that practically all of the surface broaches used at present are of high-speed tool steel and generally of built-up sections to provide for simple and economical replacement. The length of the broach may run from 12 in. to 61 in. and even longer. Only experience will show whether further advantages may be gained from the use of other types of tool materials, also the practicability of using inserts of some of the cemented carbide for certain classes of work.

While the length of the sections in a sectional broach depends entirely upon the nature of the individual job as well as the problems involved in making the segments, such sections vary rather widely between six and 14 in. in length.

Taper, Teeth and Speed

The first section in a roughing broach used by the Houde Engineering Corpn. for roughing the 1.261 in. diameter on shock absorber wing shaft forgings is ground to a uniform taper from 1.349 in. to 1.327 in. diameter; the second section from 1.327 in. to 1.305 in. diameter; the third section from 1.305 in. to 1.283 in. diameter; the fourth section from 1.283 in. to 1.261 in. diameter. Sections are resharpened by grinding from 12 to 15 times. Approximately 18,000 pieces are rough broached for each sharpening.

The first three sections in the finishing broach for this job have eleven cutting teeth, the fourth section has fourteen cutting teeth. The first section is ground taper from 1.270 in. to 1.255 in. diameter, the second section from 1.255 in. to 1.248 in. diameter, the third section from 1.248 in. to 1.247 in. diameter. The fourth section is ground straight to a uni-

form diameter of 1.247 in. Sections are resharpened from 12 to 15 times by grinding. Approximately 10,000 pieces are broached for each sharpening.

Based on current practice I find that the surface speed of external broaches ranges from 18 to 33 ft. per min., the variation no doubt taking into account the nature of the work, the material, and design of the machine.

While it would be rash at this stage to make any definite statements concerning the probable life of the broaches, the measure of tool life varies from 800 pieces per grind in the case of a semicircular cutter form for a differential case pin bearing, to 60,000 pieces per grind in roughing the teeth of a coarse tooth steering sector. In the Plymouth operation which we know to be truly representative of mass production, tool life between grinds runs from 21,000 to 31,000 pieces. In the case of the cylinder blocks with the broach taking four intermittent cuts, widely separated, the life between grinds is 7000 pieces.

Broaching Machines

When it comes to the design of broaching machines we find the trends running in many directions, since the art is now going through a formative stage. Thus we find in use at the present time, a variety of vertical machines, horizontal machines, and some continuous horizontal machines. In the vertical type we find both hydraulic and rack-and-pinion feeds.

One of the most interesting features of the present development of external broaching is that for experimental purposes, short runs, or moderate production, it is possible to use broaching machines of very simple construction often utilizing an obsolete screw press so long as it has sufficient stroke. While this is an advantage at the start, it is obviously not an economical procedure if the maximum advantages are to be derived in the way of productivity and cost reduction. In fact, as this paper is being written I understand that a number of machine tool builders are about ready to release new types of production broaching machines especially designed for external broaching.

Special Applications

Before proceeding with a detailed examination of the various applications summarized in the study. I should like to single out two interesting developments and consider them separately. The first of these is the application of external broaching to

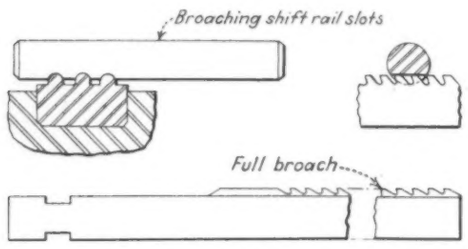


FIG. 1

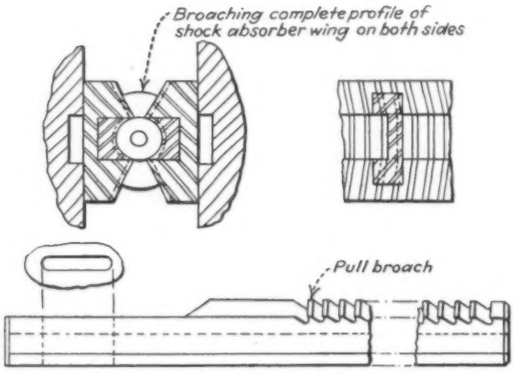


FIG. 2

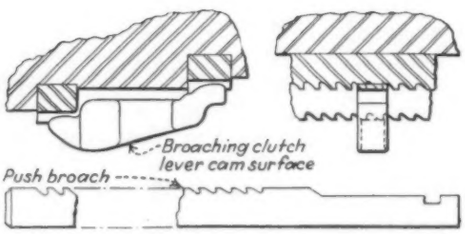


FIG. 3

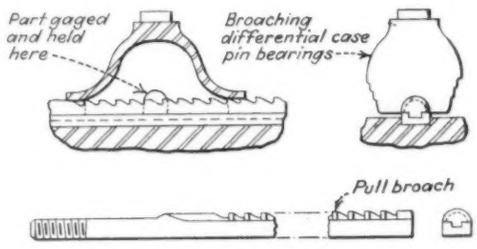


FIG. 4

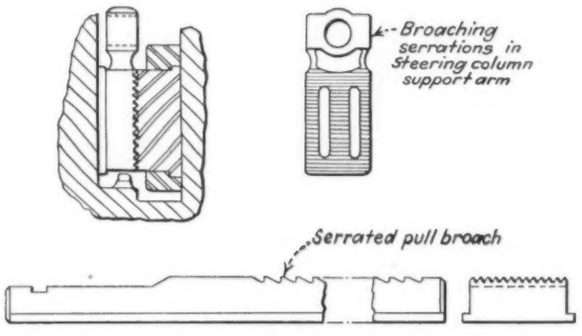


FIG. 5

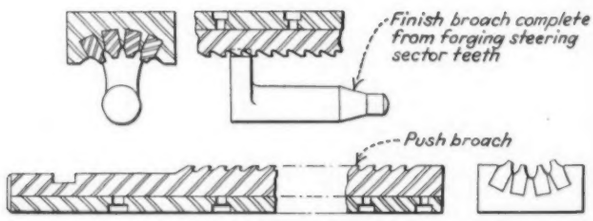


FIG. 6

Metal Removed, Tolerance and Surface Speeds in Typical Broaching Practice

Description	Material	Operation	Stock Removed	Tolerance on Finish	Surface Speed Cutting (ft.p.m.)
Crankshaft bearing cap	Cast iron	Finish joint face and ends to size	0.621 cu. in.		24
Crankshaft bearing cap No. 4	Cast iron	Step for gasket	0.221 cu. in.		18
Connecting rod	Forging	Faces large end	0.087 cu. in., two caps		22
Cylinder block	Cyl. cast iron	Four bearing cap surfaces	1.710 cu. in.		25
Shock absorber wings	Molybd. steel	Broach radii	0.600 on side	0.0005 in.	
Connecting rod	Forging	Bolt boss contours	1/32 to 1/16		
Cylinder block	Cast iron	Bearing pads	0.032 in.	0.0005 in.	
Clutch lever	Forging	Two cam surfaces	1/16		
Universal joint rings	Forging	Four cross holes	1/16	0.0005 in.	
Coarse steering sector	Forging	Roughing	0.370		
Free-wheel clutch	Forging	Outer contour	3/16	0.0005 in.	33
Free-wheel cam	Tool steel	Four tongues	0.20	Commercial	20
Connecting rod	Forging	Big end radius and faces	1/8		27
Steering sector	Forging	Roughing 5 D. P. teeth	0.410	0.001 to 0.0005 in.	33
Balance weight	Forging	Two operations: Inside surfaces Outside surfaces	3/16	0.001 to 0.0005 in.	25

the finishing of large castings such as the cylinder block; the other, roughing and finishing of gear teeth.

On the cylinder block the outstanding example is the operation at Plymouth in which four main bearing cap surfaces are finished in one pass of the broach. No details of the equipment are available. However, a similar job has been worked out by the Colonial Broach Co. in cooperation with Oilgear. The line bearings are finished to limits of plus or minus 0.0005 in. removing 0.032 in. on three sides of the previously rough-machined surfaces. A production of from 75 to 80 pieces per hr. is obtained. It is claimed that the milling equipment which this machine replaced produced only 11 to 13 blocks per hour per machine with limits of plus or minus 0.001 in. Broaching tools of high-speed steel are said to produce 4500 to 5000 blocks per grind with a life of approximately 50 grinds per tool.

Mr. Hunt tells me that at Plymouth he has broached experimentally the top, bottom, and manifold sides of cylinder blocks at the rate of 90 per hr. The speed of the broach was 28 ft. per min., depth of cut 3/32 to

(Continued on Page 74)

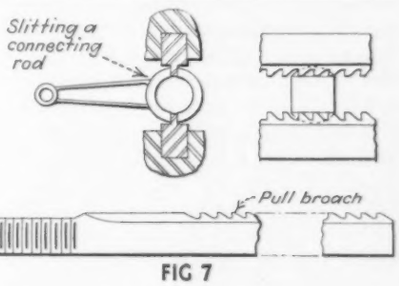


FIG 7

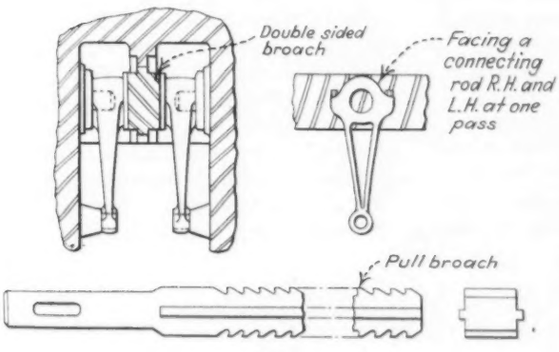


FIG. 9

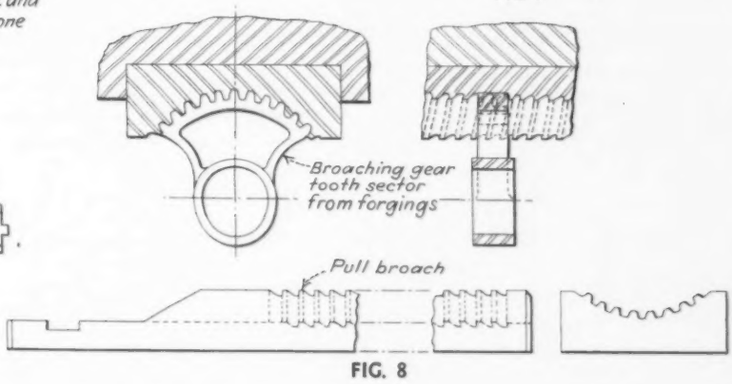


FIG. 8

External Broaching Set-ups Developed by National Broach & Machine Co. (Details Below Refer to Figure Numbers)

Description	Material	Operation	Prod. per Hr.	Pieces per Grind	Type Broach
1. Shift Rail	Steel	3 Slots	200	1500	Pull
2. Shock Absorber Wing	Steel	Comp. Profile	200	1200	Pull
3. Clutch Lever	Steel	Two Cam Surfaces	300	2000	Push
4. Differential Case Pin Bearing	Cast Iron	Semi-Circular Bearing	60	800	Pull
5. Steering Support Arm	Malleable Iron	Serrations	200	3000	Serrated Pull
6. Steering Sector	Steel	Teeth	175	1200	Push
7. Connecting Rod	Forging	Slitting	200	1500	Pull
8. Gear Sector	Cast Iron	Gear Teeth	225	3500	Pull
9. Connecting Rod	Forging	Facing	200	1500	Double Face Pull

Trend Line of Pig Iron Production H

AS the World War destroyed 5 per cent of the whole white population, the post-war world was a smaller one than the pre-war world. Therefore, contends the author, conclusions commonly drawn from the statistics of recent years to the effect that consumption has been flattening out are wrong.

Instead, growth is continuing at the former rate, only it is as though there has been a complete stoppage of consumption. In other words, the line indicating the post-war trend has been offset from the pre-war line and is not continuous with it. There has been no fundamental change in the habits of the people, he asserts, that would change the rate of growth.

He does not yet attempt to locate the new trend line, but maintains only that we are resuming the old pace. His thesis comprehends a view that United States iron production is only part of international output affected by international economic conditions.

BY common consent it is accepted as a fact that the trend curve of pig iron production has flattened out and that the cause is partly saturation as to the per capita consumption of steel and partly the replacement of pig iron by the use of steel scrap. It goes without saying that it is important, both to the iron and steel industry and to statisticians in general, to know the facts in this case. The writer is convinced that the statistics have been seriously misconstrued and the purpose of this article is to show that the trend line of pig iron production not only has not flattened out but also that the post-war trend, until interrupted by the current depression, was upward at the same rate as for 50 years before the war.

THE IRON AGE statistics for pig iron production are accepted as authoritative by the profession and the industry. These plotted in Chart I, on ordinary coordinate paper, give the curve usually accepted and the fact that the trend line A—B indisputably flattened in post-war years is accepted as proof of the declining rate of production. Rates of production are not easily read from charts on this type of paper. Ratio scale paper must be used. The same figures are plotted on Chart II. The trend line C—D would also seem proof of the contention. This line C—D, however, does not properly represent the true post-war trend.

It is a basic error to connect pre-war and post-war figures in continuous curves, because the war put a permanent downward offset[2] in the production curves of almost all raw materials, which reached its nadir, as of that time, in the year 1921, as shown plainly in the chart. Prior to the war, almost all raw commodities had for a period of 50 years or longer increased annually by a fixed percentage, differing for each product. This 50-year trend line for pig iron is shown by the line E—F on Chart III.

In the post-war period, 1924 to 1928, both inclusive, are the only years in which there was anything like economic sanity. Admittedly this is a short base with which to compare conclusions based on 50 years' experience, unless there be sound logic to buttress the conclusion. Drawing a trend line for this short period cannot be done casually or optically not only owing to the short base but also on account of the usual irregularities of the year to year variations in pig iron production and also owing to the general disruption of post-war economics.

It should be borne in mind also that a trend line is not necessarily the average line. An average line through the post-war period would be very misleading and not in harmony with

[1] 76 Beaver Street, New York.

[2] Advanced first by Percy E. Barbour, in "The Next Move in the Price of Copper Metal: Logic Points to Twelve Cents," *Annalist*, March 7, 1930.

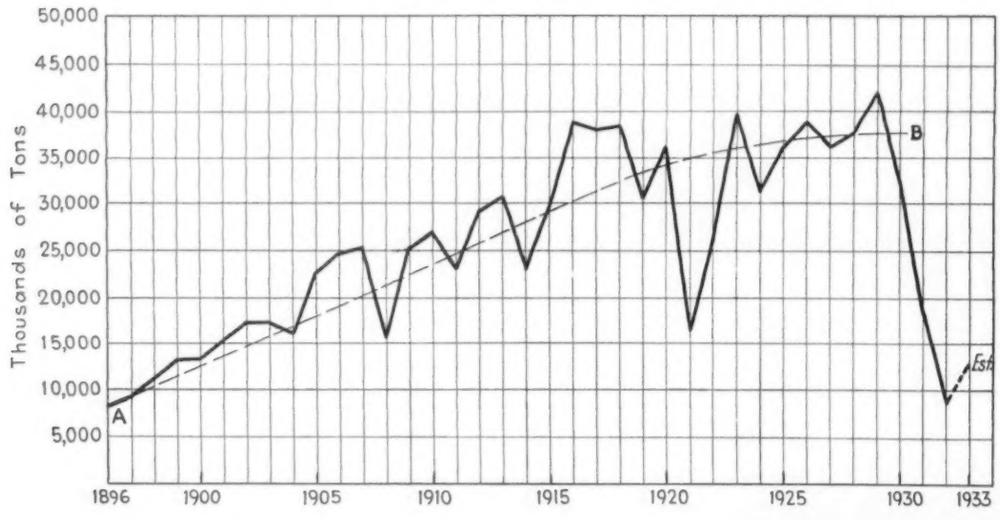


Chart I—A continuous trend line of pig iron production of the United States, drawn on ordinary coordinate paper, shows a flattening out in the post-war years.

tion Has Not Flattened Out

By PERCY E. BARBOUR
Mining Engineer[1]

the facts. The trend line will be that line which passes through most of the points of the curve during the period under examination. The line G—H passes through or very close to four of the eight years in the 1922-1929 period or half of the points, which would establish this as the trend line. Moreover the year 1928 is not too far from the trend line to be disregarded as one of the controlling points, which gives five out of eight.

This is the logical trend line. Moreover it is parallel to the 50-year trend line. This too is not only logical but to be expected in view of all the facts, most of which are too commonly overlooked. A study of other raw commodities shows that in general since around 1922, until 1929 drastically changed everything, the trend lines have been parallel to the previous 50-year trend lines, but starting from a lower base in each case.

If there were no fundamental changes in the habits of the people there would be no reason to expect a change in the rate of consumption until a saturation point had been reached, if and when that point must theoretically come.

After the war there was of course great speculation and great financial abuses and many other great excesses but there was no fundamental change in the habits of the people which would effect the trend line, such as a preference for some other material for construction. The line G—H is the normal trend line for the period. It, however, starts from a new and lower base; it is not a part of the pre-war trend; and no continuous trend line can properly connect the two. We cannot expect ever to get back on to the pre-war trend line projected into the future, because the world was definitely made smaller by the war. This conclusion was set forth at considerable length by the writer elsewhere.[3] Suffice it to say here, the result of that research showed that as of 1930, the world was smaller by 34,000,000 souls as the result of the military and civilian losses owing to the war, based on the vital war statistics of Dumas and Vedel-Peterson.[4] This loss of population was almost entirely white and was equal to 5 per cent of the total white population of the world. The white people are the principal steel consuming people. It is obvious that the consuming population cannot be reduced by so much as 5 per cent without its having a grave effect on our economic structure and without its showing plainly in the statistics and the curves. It logically follows that one cannot connect with continuous trend lines figures of a pre-war world of one size with a post-war world of another size. It is because of the failure to recognize this fundamental change in the size of the consuming public that erroneous conclusions from statistics are being made and erroneous trend lines are being drawn.

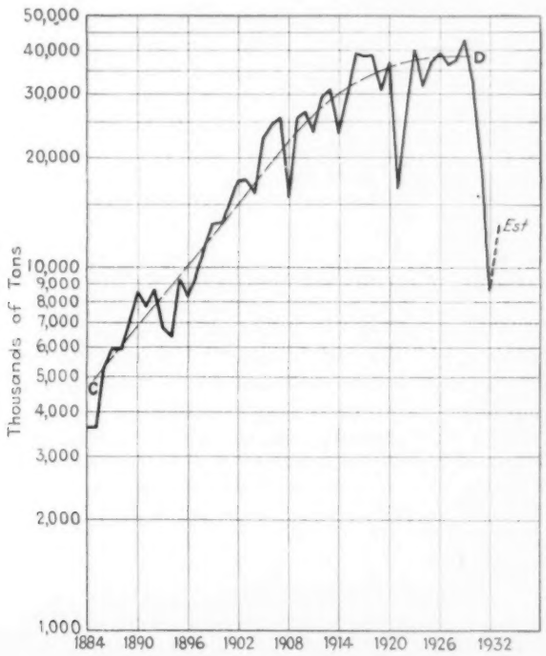
It hardly needs to be mentioned that while our losses of personnel were not relatively great owing to the war, steel is an international commodity, and we have already well learned the lesson that we cannot escape in this country the effects of serious economic disturbance abroad.

It is obvious, therefore, that the post-war trend line must start from a lower base, which the line G—H does. The trend lines of almost all other raw commodities have this same permanent downward offset and moreover they all resume the parallel

(Concluded on Page 76)

[3] "The Downward Offset in the Trend of World Commodity Consumption," by Percy E. Barbour, *Annalist*, Oct. 21, 1932.

[4] "Losses of Life by War," published by the Carnegie Endowment for International Peace.

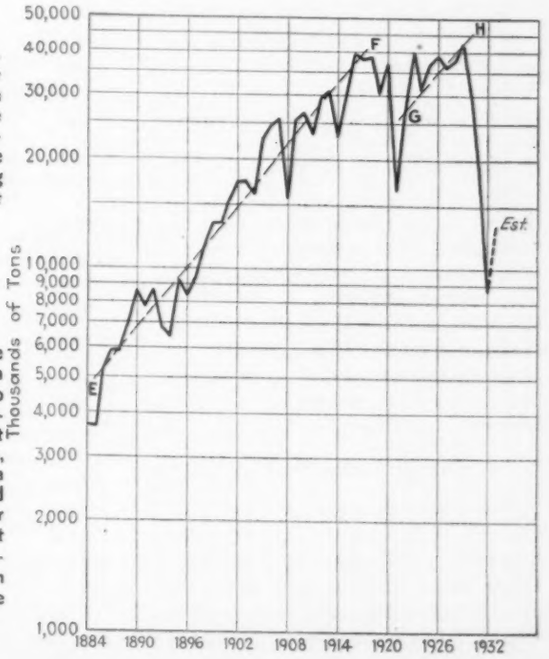


AT LEFT

Chart II—A continuous trend line for pig iron production when plotted on the ratio form of coordinate paper likewise indicates a flattening in the more recent years.

AT RIGHT

Chart III—With the pig iron production figures referred to the ratio scale ordinates and straight line trends drawn, the author finds a new parallel trend line for the later years — a line not definitely located except for parallelism with the line for the earlier years.



How Attractive Finish

By GUSTAF SODERBERG

Corrosion resistance is the first consideration in the finish of a good washing machine. Appearance and cost are important secondary factors. ▲▲▲

THE manufacturer of most any metal part, say for a radio, a washing machine, or for an electric refrigerator, is faced with the problem of selecting the most advantageous finish. Many factors determine his choice; sales value, durability, utility, cost, and others. Unfortunately, the significance of the problem is not generally appreciated, and unsuited or inappropriate finishes are all too common in most any miscellaneous group of metal products.

Some of the features governing selection have been considered in earlier articles in this series. These included the sales value of an attractive finish and the remarkable progress in the development of new finishes and new finishing materials.

Lack of knowledge of available finishes probably is responsible for many of the selections now regularly made. This article attempts to present a practical basis for selection within the realm of electroplating, and more particularly in reference to some nine or ten of the best known electroplated coatings.

Coating Characteristics

This relatively small group of coatings offers a broad array of characteristics. Some have excellent decorative value but give little protection of the base metal against corrosion; others possess corrosion preventive properties but have no "eye appeal"; one or two others have an advantageous combination of the two. To give a ready picture of the various properties, the essential characteristics have been summarized in the two accompanying tables.

In both tables a distinction has been made between acid and cyanide baths when normal practice prevails. The reason is that the composition of the baths has considerable bearing on the properties of the coatings as shown in the tables, and they are therefore used for somewhat different purposes. It should be noted that there is also a difference between various nickel baths, cadmium baths, and between some others, and that the data given refer to results obtained with the best available baths in each case.

Some Usual Combinations

Chromium coatings are generally applied as thin, flash coatings over nickel, or over copper plus nickel, to prevent the tarnishing of these undercoatings and to provide new appearance characteristics. The thin chromium coatings, 0.00001-0.00002 in. thick, by themselves, cannot be expected to add much to the rust resistance. Some of the most frequently used combinations are: cyanide copper-nickel-chromium, cyanide copper-acid copper-nickel-chromium, and nickel-acid copper-nickel-chromium. Ordinary nickel plate without chromium is also frequently applied over a preliminary cyanide copper coating. Nickel and nickel-chromium are sometimes applied over cadmium for the purpose of obtaining greater corrosion resistance.

The thickness of the coating has little to do with its appearance except that a certain minimum thickness is necessary when the coating is to be abraded by buffing or scratch brushing. The thickness, however, is most important when the durability of the coating is considered. If properly applied, the thicker the coating, the longer it protects against corrosion. Table II gives the approximate corrosion resistance obtained by the application of different coatings and for thicknesses noted. Generally speaking, the more severe the exposure, the thicker should be the coating. A combination of two or several coatings will generally increase the protective value. Thus, when one talks about the protective value of chromium coatings, one really considers its protective value plus that of the undercoatings. This is proportional to the total thickness.

Corrosion and Appearance

Most coatings will stay unchanged for a long period of time if they are kept in pure dry air, but when they are exposed to moisture and corrosive atmosphere their appearance changes a great deal. This is indicated in the table under appearance after exposure.

The softest coatings which do not withstand abrasion at all, frequently are used for "wearing in" tight fitting parts because they flow instead of crack. Thus, tin coatings are being used on automobile pistons.

In the second table an attempt is made to evaluate the efficiency of the baths in respect to surface recesses. All plating baths tend to cause the heaviest coatings to be built up on protruding points. Some baths, however, and particularly the alkaline baths, distribute the plate more evenly. This is most important from the standpoint of cost, because it is

THE recent articles in this series have dealt with the problem of preparing metal for final finish. After preparation, it becomes necessary to consider the kind of finish to use, and the accompanying article gives some practical considerations governing the selection of an electrodeposited coating.

This series on metal finishing is being prepared under the direction of Herbert R. Simonds for THE IRON AGE. Mr. Soderberg is technical director, Udylite Process Co., Detroit.

Helps Metal Products Sales

Selecting the Proper Coating—II

the thinnest portion of the plate which determines its value for corrosion protection. When a bath is used which is efficient in coating the recesses, one need not put on an extremely heavy average thickness of plate to get the required minimum thickness.

Under the heading of costs, such factors as depreciation of equipment, materials, labor costs, and power have been included to give the total shown in the table.

Cost Has Many Factors

Of course the full cost also depends on the number of extra operations necessary. Thus, while bright cadmium is generally applied directly on the base metal, nickel and chromium plating require polishing of the base metal and also that the undercoatings be buffed before each plating operation. The cost of polishing and buffing is generally at least equal to the total plating cost. Buffing operations remove plate from protruding edges and this often leads to complications from a corrosion resisting standpoint unless heavy coatings are used.

There is still another angle to costs. The reader will note that the cost of the chromium coating is designated as fairly high. This statement refers to the chromium coating alone, and does not include the cost of the composite coatings used in conjunction with chromium. When the costs of the copper and nickel undercoatings, together with the buffing and polishing operations necessary, are added to the cost of the chromium coating, the total is considerably higher than is indicated in the table.

For the purpose of explaining the function of the tables in choosing the proper electrodeposit, it may be well to take a few practical examples.

A manufacturer of refrigerator hardware wants a brilliant, permanent finish, or, in other words, appearance is his primary consideration. While cost is a factor, appearance is paramount. Corrosion prevention is not unduly important since refrigerator parts are not usually subjected to severe exposure conditions.

Using the Tables

Being chiefly interested in appearance, the manufacturer looks under appearance in Table I and runs down the column until he comes to nickel, chromium, cadmium, and brass. Nickel, cadmium, and brass he discards because they tend to discolor, as indicated by their change on exposure, and frequent polishing to re-

COATING CHARACTERISTICS—TABLE I

Coating	Main Purpose of Application	Commonly Used Thicknesses Expressed in inches	Protective Value	Appearance Initial	Appearance After Exposure	Resistance to Abrasion
Acid zinc	Rust protection	0.0005-0.0010	Excellent	Bluish satin	Dark gray	Poor
Cyanide zinc	Rust protection	0.0005-0.0010	Excellent	Matte white	Dirty gray	Poor
Cyanide copper	A—Base for "oxidized finishes"	0.0001-0.0003	Poor	Colored and Lacquered		Fair
	B—Base for nickel plating (See Note 1)	0.0001-0.0005	See Note 4	Salmon red (See Note 6)	Black to green	Fair
Acid copper	Base for nickel plating	0.0003-0.0005	See Note 4	Salmon red (See Note 6)	Black to green	Fair
Nickel	A—Appearance and rust resistance directly on steel (See Note 2)	0.0003-0.0010	See Note 4	Matte yellowish white (See Note 6)	Dark to brown	Good
	B—On steel over copper plate	0.0003-0.0008	See Note 4	Matte yellowish white	Dark to brown	Good
	C—On copper or brass	0.0002-0.0006	Good	Matte yellowish white	Dark to brown	Good
	D—Directly on zinc	0.0003-0.0005	Fair	Matte yellowish white	Dark to brown	Good
Chromium	A—Appearance (See Note 3)	0.00001-0.00002	See Note 4	Bluish white—mirror like	Unchanged (See Note 5)	Fair (thin!)
	B—Abrasion resistance	0.001-0.005	Excellent	Frosty bluish white	Unchanged	Excellent
Cadmium	Rust resistance and appearance	0.0002-0.0005	Excellent	White lustrous	White	Very poor
Tin	A—Corrosion resistance on copper and brass	0.0003-0.0010	Excellent	Frosty white	Grayish	Very poor
	B—Minimizing piston wear	0.0010	Good	Frosty white	Grayish	Very poor
Brass	Appearance (often colored and lacquered)	0.0001-0.0003	Poor	Satin yellow to bronze (See Note 6)	Black to green	Fair

Note 1—Sometimes substituted for part of cyanide copper—never direct on steel.
Note 2—As plated, buffed or scratch brushed.
Note 3—Over nickel and nickel plus copper—also rust resistance.
Note 4—Total coating of copper plus nickel plus chromium on steel should not be less than 0.0010 in. thick for outdoor exposure.
Note 5—Also resistant to oxidation at high temperatures.
Note 6—Lustre is obtained by buffing or analogous mechanical treatment after plating.

store luster might cut through the coating, exposing the base metal. So, by a process of elimination he arrives at chromium which retains its luster. The cost of chromium he has found from the cost data in Table II, to be higher than that of the other finishes, but in this instance cost was not of primary importance. As only a fair amount of corrosion resistance is needed, relatively thin coatings can be applied, which decreases the cost somewhat.

Finish for Steel Radio Chassis

Let us next consider a more complicated problem—the proper finish for a sheet steel radio chassis, which is formed in such a fashion as to present several deeply recessed surfaces. The considerations here are rust prevention, cost, appearance, and ability to deposit into recesses. Looking first at the column headed protective value, we find **acid zinc, cyanide zinc**, cadmium, and very heavy chromium coatings, as those providing steel with excellent protection. Proceeding to the next classification, namely, cost, we see acid zinc having a slight edge. Heavy chromium is eliminated because of its high cost.

Next comes appearance, which serves to eliminate both zinc coatings because they are apt to discolor upon exposure. Furthermore, the acid zinc bath does not efficiently "throw" into recesses of any appreciable depth. In this respect, cyanide zinc is a little better. A properly formulated cadmium bath has the faculty of being able to "throw" into recesses, a fact which further contributes to the low cost of the cadmium coating.

Appearance and Protection

The choice of the proper finish for steel suspension arms for filing cabinets involves considerations similar to those just cited, except that "throwing" into very deep recesses is not particularly involved. The relatively poor appearance of cyanide zinc after weathering is a drawback to its use,

Appearance is the paramount consideration in selecting the finish for this article. Resistance to corrosion and wearing qualities are the next consideration. But the "eye appeal" is so great a factor in the whole merchandising scheme that cost of the finish is relatively unimportant.

which explains why many manufacturers of office equipment are using cadmium.

In the case where a part has a rather flat surface, and rust protection at low cost is the big factor, with appearance of secondary importance, acid zinc is being broadly and profitably used.

There are a number of parts which can be nicely finished with any one of several coatings. Take, for example, a lighting fixture. Cyanide copper which is oxidized, relieved, and lacquered, produces a pleasing effect; buffed or brushed nickel gives a nice appearance; chromium, though effective, often requires composite coatings of copper and nickel underneath and is used for more expensive fixtures only; cadmium can be applied directly and, when properly done, makes a pleasing appearance, with no extra operations necessary to increase the luster; lacquered brass coatings find favor in many cases because of their color and comparatively low cost.

PROCESSING DATA—TABLE II

Coatings	Efficiency in Coating Recesses	Control of Plating Process	Total Plating Costs Per Usual Thickness	Extra Operations
Acid zinc	Poor	Very simple	Low	.....
Cyanide zinc	Fair	Fairly difficult	Fairly low	.....
Acid copper	Poor	Very simple	Low	Polishing of
Cyanide copper	Good	Fairly difficult	Fairly low	Base metal,
Nickel	Poor, fair	Fairly difficult	Fairly high	Buffing of coating
Chromium	Very poor	Simple	Fairly high	.....
Cadmium	Good	Simple	Fairly low	.....
Tin	Good	Difficult	High	.....
Brass	Good	Difficult	Low	Lacquer coat

Lake Superior Ore Shipments in 1933

TOTAL shipments of ore from the Lake Superior district in 1933 amounted to 21,672,410 gross tons, according to the annual report of the Lake Superior Iron Ore Association. The all rail movement was 48,732 tons as compared with 20,693 tons in 1932. Of the total shipments 62.1 per cent was from the Mesabi Range.

The amount of ore beneficiated was 4,982,753 tons, not including ore crushed and screened in Michigan and Wisconsin mines, the amount of which has not yet been tabulated. This compares with 1,196,129 tons beneficiated during the previous year.

There were 122 mines in operation during the year as compared with 68 during the previous year when the total movement was only 3,588,608 tons. Ore was shipped from 53 Mesabi district mines, a gain of 25 as compared with the previous year; from 19 Marquette Range mines, a gain of 5; from 22 Menominee Range mines, a gain of 22; from 4 Vermilion Range mines, a gain of 1; from 12 Gogebic Range mines, a gain of 7 and from 12 Cuyuna Range mines, a gain of 8.

As during the previous year the largest amount shipped was from the Hartley-Burt mine in the Mesabi district, which produced 2,175,464 tons. The Sellers mine in the same district occupied second place with shipments of 1,082,435 tons. Both mines are operated by the United States Steel Corpn.

BENEFICIATED ORE, 1933

	Minnesota	Michigan and Wisconsin	Total
Washed	2,331,328	.....	2,331,328
Jigged	489,387	.....	489,387
Sintered	48,163	.....	48,163
Sinter-Dried	149,824	.....	149,824
Dried	115,955	.....	115,955
Total concentrated	3,134,657	.....	3,134,657
Crushed or screened	1,848,096	*	
Total beneficiated	4,982,753		

*Tabulations not complete.

SHIPMENTS OF LAKE SUPERIOR IRON ORE BY RANGES

(Gross Tons)

Range	To Upper Lake Ports	All Rail	Total, 1933	Total, 1932
Mesabi	13,471,025	600	13,471,625	1,934,719
Marquette	2,760,112	47,213	2,807,325	357,262
Gogebic	2,400,767	165	2,400,932	673,425
Menominee	1,510,538	447	1,510,985	307,721
Cuyuna	740,832	307	741,139	98,737
Vermilion	740,404	.....	740,404	216,744
Grand Total	21,623,678	†48,732	21,672,410	3,588,608

†Includes 827 tons lost in transit.

Choosing the Right Drive—8

The Herringbone Gear Reduction Unit Method

By WILLIAM STANIAR
Mechanical Power Transmission Engineer
E. I. DuPont de Nemours & Co.

THIS type of speed reducer consists of herringbone gears mounted in a cast iron housing, suitably arranged for either single, double or triple reduction. In the double reduction type three designs are available, the principal difference being in the relation of the power input or high speed shaft to the power output or slow speed shaft. In one design the shafts are offset or placed in parallel as shown by Fig. 55, in another the shafts drive in a straight line as shown by Fig. 56, while in another as shown by Fig. 57, use is made of spiral bevel gears in combination with herringbone gears making right angle driving possible with this method. However, the right angle arrangement is seldom employed because of high cost as compared with the single worm gear reduction unit.

Prior to 1914, herringbone gears were cut by the hobbing system which produced a groove between the right and left hand helices of the tooth face. During 1914 a machine was perfected capable of cutting herringbone teeth with sharp apexes which resulted in a smoother operating gear set. This form is known as the "Sykes" tooth and is employed in practically all modern herringbone reduction gear units.

The single reduction unit as shown by Fig. 58, consisting of one pinion and one gear can be obtained with ratios from 2 to 1 to approximately 10 to 1 and for any practical power requirement. The double reduction unit consisting of two gear trains can be obtained with ratios from 4 to 1 to approximately 80 to 1 and for any practicable power requirement. The triple reduction consisting of three gear trains can be obtained with ratios up to 1000 to 1 with proportional power capacity. Naturally in the triple reduction unit a large housing is required for high powers and the expense involved is high.

CONSIDERABLE flexibility in design is afforded in speed reducing units by the use of herringbone sets. Single, double and triple reductions are in use, with velocity ratios ranging from 2 to 1 to 1000 to 1 and with proportionate power capacities. Continuous, smooth operation at high speeds is characteristic of units of this type. Another useful attribute is shock absorbing ability.

The modern unit is of rugged design and with comparatively small pitched teeth is capable of transmitting large powers particularly in the single and double reduction type. During the past few years it has become a real competitor of the worm reduction unit, based on its simplicity of design and smoothness of operation. It operates in a fluid lubricant which can be applied by either the splash or circulating system.

The driving in line and the driving in parallel are the two distinct types of herringbone double reduction units. One type consists of two sets of trains of gears arranged in series, while in the other the first set of gears is split, consisting in reality of two sets of helical gears, one set being cut one hand the other the opposite hand. They are mounted far enough apart to allow the insertion of the final drive pinion between the helical gears. It is claimed that this form of construction tends to equalize all bearing loads; however, based on the successful operation of both methods of construction, such points are difficult of determination. Choice is really a matter of whether the driving in line feature of one or the driving in par-

allel of the other is more suitable for the application in question.

Uses

The herringbone reduction unit should be employed for heavy loads at high speeds because it has many attributes adaptable to this class of service. This method furnishes continuous smooth, noiseless gear action because of two teeth always having two points of contact in the plane of axis. Gears of this character possess great strength, resistance to load bending action, no back-lash, and are capable of transmitting high powers through comparatively small gears.

The herringbone tooth abolishes end thrust and due to the elimination of vibration and low power consumption, long life can be expected. Based on its efficient performance under heavy loads at high speeds this type of reducer has numerous applications in the process manufacturing plant, but the necessity for such a unit is small in production shop driving.

The most useful gear arrangements are the single and double reduction because their power, ratio and input speed range fulfill most all industrial requirements. The single reduction unit can be obtained with power capacities from 1.1 to 700 hp. at ratio ranges from 1.75 to 8.35 to 1 and with input speed possibilities of 100 to 1800 r.p.m. The double reduction unit can be obtained with power capacities from 0.43 to 1335 hp. at ratio ranges from 7.8 to 56.6 to 1 and with input speed possibilities of 300 to 1800 r.p.m.

There are many operations in the process industry as illustrated by Fig. 59, where heavy loads demanding high power transference at low velocity ratio from the motor exists. For this class of power transmission, particularly where intermittent shock loads and frequent reversal of rotation occur there is no better solution than the herringbone reduction unit. Apparatus requiring 200 to 500 hp. is not uncommon in industrial opera-

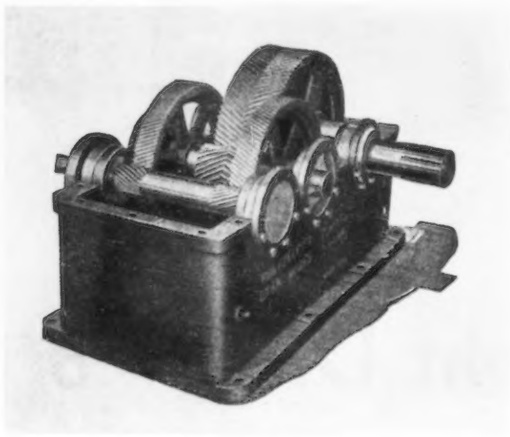


Fig. 55—Parallel shaft drive is shown as one variation of the double reduction herringbone reducer.

Fig. 57—Using spiral bevels in place of one pair of herringbone gears permits right angle driving as a third variation in design.

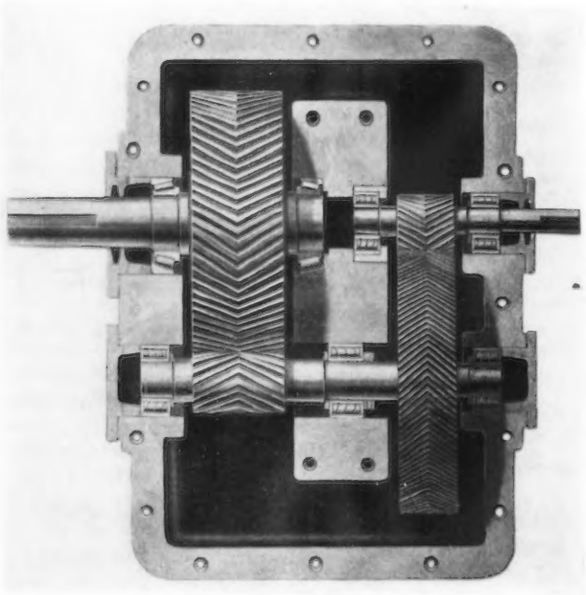


Fig. 56—The double reduction herringbone may be arranged with driving and driven shafts in one line.

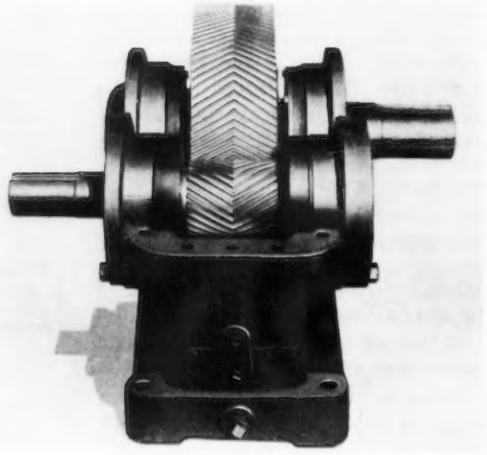


Fig. 58—Single reduction herringbone units are available for any practical power requirements and with speed ratios up to 10 to 1.

tions and in many instances this power must be applied at speeds ranging from 200 to 300 r.p.m. With the single reduction herringbone unit direct coupled to a 900 or 1200 r.p.m. motor these speeds and powers can easily be obtained.

The herringbone reduction gear method is a rigid connection regardless of its shock absorbing characteristics, therefore consideration must be given to the method of connection between motor, reducer and load application. The heavy duty type is generally applied to high starting torque and shock loads, probably more so than any other class of reducer, therefore as a protection to motor and reducer the torsional resiliency type of flexible coupling should always be employed. There must be a cushion effect between load and gears, otherwise high maintenance and short reducer life will result. In the lower power and higher ratio field where this type is also applicable the possibility of shock and high starting torque may not exist. If such be the case, flexible couplings of the more rigid types can be employed.

Power Ratings Are Conservative

The power ratings of commercial herringbone reduction units are generally conservative, being based on factors permitting of continuous non-pulsating loads and 100 per cent momentary overloads, therefore it is not always necessary to select units with ratings equal to the prime mover.

Based on these facts of design an economical installation can best be had if the selection is determined by the actual load to be carried. Selecting units with ratings equal to the source of power may result in an uneconomical installation unless the drive is to be subjected to overloads maintained longer than to permit classing them as "momentary." In such a case, the rating of the prime mover should be used. The herringbone reducer can be employed as a speed increaser as well as a reducer, but for such service special consideration is necessary.

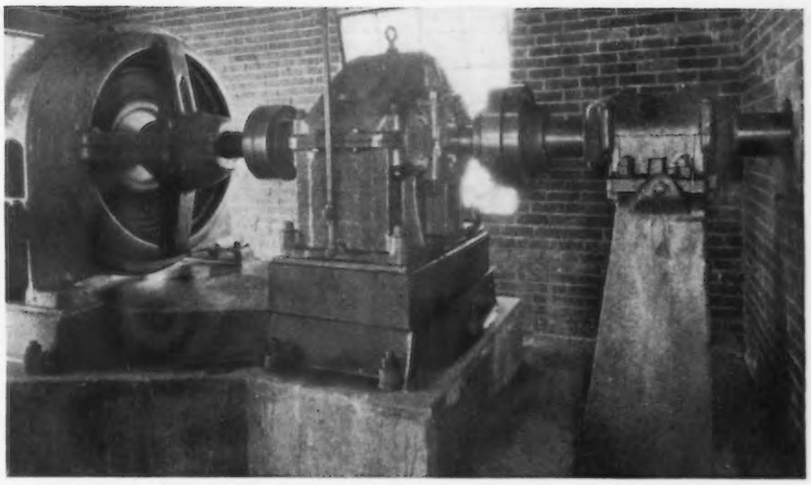


Fig. 59—For heavy loads that demand high power and large velocity ratios, the herringbone unit is particularly useful.

Process Manufacturing Plant Driving

METHOD	Herringbone reduction unit.		
TYPES	Single Reduction Shafts Offset	Double Reduction Shafts Offset	Double Reduction Shafts in line
SERVICE	Where high power shock loads exist. Where space is limited and shafts in parallel are adaptable. Where high input apparatus speed is necessary. Where velocity ratio increase is necessary. Where overhung loads are necessary at high input speed. Where velocity ratio does not exceed 10:1.	Where high power shock loads exist. Where shafts in parallel are adaptable. Where medium input apparatus speed is required. Where velocity ratio does not exceed 60:1.	Where high power shock loads exist. Where input and output shafts must be in line. Where medium apparatus input speed is required. Where velocity ratio does not exceed 60:1.
PERMISSIBLE INPUT SHAFT SPEEDS	100 to 1750 r.p.m.	300 to 1750 r.p.m.	580 to 1750 r.p.m.
RATIO CAPACITIES	1.75 to 8.35 to 1 Standard.	7.8 to 56.6 to 1 Standard.	10.1 to 70.1 to 1 Standard.
HORSEPOWER CAPACITIES DEPENDING UPON RATIO	1.1 to 700 Standard.	0.43 to 1335 Standard.	0.6 to 300 Standard.
LUBRICATION	Fluid lubricant by splash system.	Fluid lubricant by either splash or circulating system.	Fluid lubricant by either splash or circulating system.

NOTE: Triple reduction units have a ratio range from 46 to 318 to 1, permissible input speeds from 580 to 1750 and horsepower capacities from 2.6 to 25. These figures are for standard units.

A.F.A. Convention and International Foundry Congress

EXECUTIVE secretary C. E. Hoyt announces that the board of directors of the American Foundrymen's Association has voted unanimously to hold the 1934 convention and exhibition of the association in Philadelphia, Oct. 22 to 26, 1934, and a convention without an exhibition for 1935.

The executive secretary also announces that the International Committee of foundry technical associations has awarded to the American Foundrymen's Association the honor of holding in the United States in 1934 the Fifth International Foundry Congress and Exposition. The staging of this important event in connection with the annual convention of A.F.A., which is usually held in May, has been set for the week of Oct. 22, a date following the annual conventions of the cooperating European associations.

The meetings, exposition and international congress will be held in Philadelphia's new auditorium, one of the largest and most completely equipped convention halls in the world.

The overseas countries whose foundry associations are members of the committee on international congresses include Great Britain, Spain, Belgium, Czechoslovakia, Italy, France, Germany and Holland.

It is the plan of the directors that the 1935 convention without an exhibit shall be similar in character to the very successful one held at the Edgewater Beach Hotel in Chicago in June, 1927, following the International Foundry Congress held in Detroit in the fall of 1926.

Preventing Porosity in Non-Ferrous

By J. H. CHEETHAM
Factory Manager, Chance Co., Centralia, Mo.

TO purify metal, in the matter of non-ferrous castings, is to eliminate foreign or undesirable elements which may keep it from functioning properly for the purpose intended and which tone it to make the elements amalgamate. To prevent contaminated metal requires a neutral flame in case of oil and gas melting and also careful temperature control. If the metal "soaks" in the furnace too long, it gets off on its mixture, absorbs oxygen, and is contaminated with various oxides, such as soluble cuprous oxide, zinc oxide, tin oxide, etc. These oxides often break up into a powder with a dust like appearance and may be in batches or completely mixed with the metal.

Purifying Agents

Contamination with gases and oxides may be cured by several methods but the metal cannot be successfully remedied while it is melting and absorbing the undesirable elements.

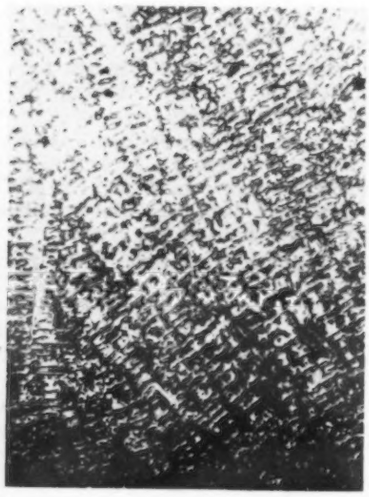


Fig. 10—85-4-5-6 mixture; homogeneous metal; magnification 100 diameters; etched with H_2O_2 and NH_4OH.

Phosphorus:

Phosphorus more often acts as a purifier through being a deoxidizing and "densifying" agent. It tends to make the metal solidify more readily, which in turn breaks up the crystals and makes them smaller and of closer grain. It also helps prevent eutectic segregation by the elimination of gases and the void space around the crystals. It should again be repeated that phosphorus is more often ruinous to metal owing to its improper use and application. (See phosphorus under "Deoxidizing Agents" for other merits and its proper application.)

Boron:

Boron acts as a purifier mostly through being a deoxidizing agent. (See Boron under "Deoxidizing Agents.)

Copper Oxide:

Copper oxide has been useful as a flux to the author as a purifying agent only. Through extensive tests its most advantageous use has been to eliminate aluminum or iron in brass and bronze alloys. In case the alloy is contaminated with aluminum the most successful and effective method of using copper oxide is when the first pot of metal out of the furnace shows an oily surface which cannot be skimmed off and its surface color is bluish. The metal skimmer or foreman will add 1½ oz. of copper oxide with a handful of charcoal to the bottom of each 100 lb. capacity pouring pot. The metal from the furnace is then poured on them. It will necessitate a little more careful skimming but the result will be pressure tight castings unless the mixture has a very heavy dose of aluminum, in which case 50 per cent virgin metal and 1½ oz. of copper oxide to 100 lb. of mixture will give sound metal. Careful cost has given a saving of 1.2c. a lb. by the former method while, if added in the furnace, there is an added cost for fuel and overhead.

To remove iron impurity, copper oxide added to the furnace will segregate up to 10 per cent. However, as most irons contain carbon, 2 per cent of 50/50 soda ash and silica sand should be added after the first skim. The metal should be skimmed more often than usual and until the surface no longer shows black blisters.

Fig. 11—85-4-5-6 mixture; homogeneous metal, cementation of crystals; magnification 250 diameters; etched with 1-1 HNO_3 + HCL; black dots are dirt on plate emulsion.

Nickel:

Nickel acts as a purifier through its function as a deoxidizer. It counteracts the oxygen and helps to suspend the lead in the matrix of the copper due to its affinity for both copper and lead. (See Nickel under "Deoxidizing Agents" for other qualifications and uses.)

Castings ▲▲▲

IN three articles, of which this is the third (the others appearing in the issues of Feb. 1 and Feb. 8), the author has described how he has overcome troubles met in the manufacture of non-ferrous castings. His articles may be said to have diagnosed the diseases and then, what is more important, to have detailed the cures.

Zinc:

Zinc acts on the copper by perfect amalgamation within large percentages and drives off the oxygen which is so readily absorbed by the copper. One or two per cent is often added just before pouring in order to help eliminate absorbed gases in melting.

Manganese:

Manganese is a purifier when used as a deoxidizing medium in that it has a great affinity for sulphur gases and oxides. It collects these gases and oxides and rises to the surface to be skimmed off. Due to its high cost and danger in spoiling the alloy, the author does not recommend its use as a purifier.

Silicon:

Silicon is a purifier when used as a deoxidizing agent, but, owing to its foaming action with lead, which causes lead silicate, it should not be used in brass or bronze alloys containing over 7 per cent lead. Silicon in alloys containing over 7 per cent lead gives "scabby" surfaced castings and makes the metal sluggish. It is used extensively as a purifier in making long-life aluminum and high tensile strength bronze. Silicon, in the author's opinion, will be more commercially used as its benefits become better understood. It is finding a larger field each year in automotive, marine, and aeronautical aluminum work, where a close grained, tougher, and harder metal is required than with the common aluminum alloys.

Sodium Carbonate (Soda Ash):

Soda ash makes a good flux to purify scrap metal of foreign elements. The author does not favor its use in the general brass foundry, as the metals it is best used with are not good to use for sound castings. It is a stronger lye constituent than borax and attacks furnace linings badly.

Sodium Chloride (Salt):

Salt is a good purifier for most all brass and bronze castings and can be used commercially if ¼ per cent of the weight of the melt is added in the furnace. Its low melting point allows it to penetrate the metal thoroughly and serves as a scavenger for impurities.

Charcoal:

Charcoal acts as a purifier in that the CO_2 (or carbon dioxide) has an affinity for copper oxides and, due to the heat reaction, causes them to escape to the surface of the metal where they can be skimmed off. The author favors pouring the metal on the charcoal and skimming before pouring. (See Charcoal under "Deoxidizers" for use, etc.)

Silica:

Silica, when used, should be in the form of sand and not used in large quantities, as too much will settle in the bottom of the furnace in the form of a slag clinker and keep on accumulating. Three pounds to a ton melt is about the maximum the metal will melt without clinkering. As the silica melts, it acts as a scavenger for oxides and purifies the metal. Sand is a scavenger for iron in bronze; if applied as stated it forms ferrous silicate, which can readily be skimmed off as slag.

Fig. 12—85-4-5-6 mixture; slag inclusion from flux; magnification 100 diameters; etched with $NH_4OH + H_2O_2$.

Calcium Hydroxide (Plaster of Paris):

Plaster of Paris is not recommended for the general brass foundry, but is recommended for smelters and refiners in scrap metals, as it purifies the metals by slagging the impurities.

Barium Sulphate:

Barium Sulphate, when properly used, acts as a purifier, mostly through being a deoxidizing agent in eliminating oxides. (See Barium Sulphate under "Deoxidizing Agents".)

To render the metal fluid is to add elements during the melting process or just before pouring either to thin the metal or to retain its molten temperature. It is often thought that some elements, such as phosphorus, increases the temperature, but this is not so, as will be explained. Tin acts as a "fluidizer," but, as tin is generally a part of the alloy, it should not be included as a flux.

Fluidity Agents

Metal can be raised to a higher temperature to increase fluidity, but in so doing the alloy is likely to be ruined by boiling out some of the elements or allowing the metal to absorb oxygen, which in turn causes bad castings. The common and more popular "fluidizing" elements are:

Phosphorus:

Phosphorus is often erroneously thought to add heat to the metal, especially when added just before pouring because of increased fluidity, but the author finds that, if added to the surface of the metal just before pouring, it reacts to prevent chilling the surface and allow the metal to flow according to the temperature under the surface. The phosphorus creates an additional heating gas on the surface which in turn prevents further oxidation and metal freezing. This action allows the metal to flow freely. An overdose of phosphorus added into the pot of metal just before pouring, and if stirred into the metal, will cause a boiling action which allows the metal to absorb additional oxygen and cause bad castings. One to two ounces of 15 per cent phosphor-copper, preferably shot form, should be added after skimming the metal just before pouring to get the best results for fluidity. Phosphorus reduces the conductivity of pure copper for electrical castings and should not be used.

Aluminum:

Aluminum in brass or bronze suppresses the zinc flare and acts similarly to phosphorus, in that it creates a surface film protection similar to grease on water against metal freez-

ing and oxidation, which contaminate the metal and cause dirty or misrun castings. It should never be used for pressure castings, as it causes a foaming action to the metal. It also destroys the crystal cements, thereby causing leaky castings. Aluminum does its worst damage when added to an alloy containing lead. Aluminum in very small amounts (¼ oz. to each 100 lb. of metal) is one of the best fluxes known for yellow brasses in that it helps prevent zinc fumes, allows more molds to be successfully poured per pot of metal, will run thinner castings and reduce the scrap due to zinc oxides and misruns. If aluminum is desired in alloys containing lead and not intended for pressure work, it should be used in the form of an alloyed flux, which is stocked by reliable and leading alloy product manufacturers.

Zinc:

Zinc acts to promote fluidity in copper alloys owing to its affinity for copper and its low melting point (786 deg. F.). This low melting point offsets the copper melting point of 1980 deg. F. and allows it to flow freely. One-half per cent of zinc is often added just before pouring in order to counteract oxides and sluggish pouring metal. The author, however, prefers phosphorus for this purpose.

Ammonium Chloride (Salammoniac):

Salammoniac in small amounts is an excellent fluidity promoter and cleanser for solders and aluminum in that it thins the metal and drives off oxides which cause sluggishness and dirty castings. It is best to add about 5 min. before pouring.

Zinc Chloride:

Zinc chloride is an excellent "fluidizer" and cleaner for aluminum and should be added about 5 min. before pouring and stirred well. It is most beneficial when melting aluminum scrap as it drives the dirt to the surface, where it can be skimmed off.

Hardening Agents

To increase the hardness of a metal or alloy generally requires the addition of only a small amount of some element, often of a hard nature. Many metals of a soft nature, however, make the alloy very hard. The best practice is to use prepared hardeners obtained from a reliable alloy product manufacturer who is prepared to make hardeners to specification or recommendation of his technical staff.

Hardeners are extensively used in aluminum mixtures, while toughness is mostly required of brasses and bronzes. Hardeners are best made by compounding an element with a large percentage of the base metal to be used and this compound added to the melt.

Antimony, zinc, and tin naturally harden some alloys, but are not generally used as hardening agents. There are such hardening agents as chromium, tungsten, cadmium, cobalt, etc., but the writer classes these as special hardeners whose use is limited and can be replaced by more common and cheaper elements. The principal hardeners used are:

Nickel:

Nickel as a hardener should never be used in its pure state owing to its high melting point. If the mixture is heated enough to melt the nickel, it is generally ruined. It is better to add nickel compounded with the base metal as a separate metal from the mix itself. The writer finds that nickel in small amounts up to 2 per cent will harden copper or aluminum; it will not harden brasses or bronzes.

Nickel can be purchased alloyed with copper, or tin, iron, manganese, aluminum, etc.; shot form is the best way to use it as it melts at about 500 deg. F. lower than nickel alone. Nickel closes the grains of alloys, and being amalgamated throughout the mixture it has a tendency to eliminate eutectic segregation, thereby making a denser alloy which in turn increases the hardness a little. However, the author finds through brass and bronze test that nickel increases the toughness approximately 10 to 1 of hardness.

Manganese:

When manganese is used for hardening purposes, it is generally compounded with copper, aluminum, nickel, or iron, or in combinations of them. Its main use is to toughen alloys rather than to harden them, although by making a denser metal it naturally makes the alloys a little harder. Iron should always accompany manganese in alloys because it carries the manganese with the copper better. The author does not favor the use of manganese as a hardener because of its uncertainty of action. Manganese makes a finer grain metal in aluminum castings.

Magnesium:

Magnesium readily alloys with other metals, but extreme care should be used, as it will make the metal brittle and cause extreme shrinkage. Magnesium is a powerful deoxidizer, but is too costly to use commercially. Magnesium alloys readily with aluminum and is generally added compounded with copper.

Silicon:

Silicon is best used when compounded with copper and its greatest application and benefit is in aluminum alloys. Silicon can also be purchased and used to equally good advantage when added to aluminum in the form of silicon aluminum. The 50/50 is the best grade known to the author. Silicon is almost indispensable in electrical copper castings, as it not only degasifies the copper but increases density and hardens it with very little loss in conductivity. Silicon is ruinous if used in alloys containing lead over 1 per cent, as it forms lead silicide, which gives a eutectic segregation.

Iron:

Iron in any bronze or aluminum mixture should be free of carbon. Therefore, it is best to purchase it compounded with nickel, copper or aluminum or with more than one element, according to the alloy desired. Iron plays an important part in white and manganese bronzes in that it gives strength, fine grain, and, naturally with these, hardness. It is best to add when compounded owing to its lower melting point and its better power to amalgamate with other elements, thereby making a more homogeneous alloy.

Copper:

Copper is a universal hardener for aluminum. The most popular alloy known is No. 12, which is 92 per cent aluminum and 8 per cent of copper. It is not practical to add the copper to aluminum or vice versa owing to the high melting point of copper and the low melting point of aluminum. Fifty per cent copper should be first compounded with 50 per cent aluminum and this hardener used with pure aluminum. However, commercial No. 12 aluminum can be purchased readily and is cheaper than for one to try to make the mixture himself. If other aluminum alloys are desired, the author advises purchasing a prepared hardener from reputable and reliable alloy product manufacturers and following their instructions.

Summary

In conclusion, the writer feels that unless the foundryman or engineer has studied results from the use of various fluxes, furnace operation and grades of metal, much of the above will not be readily understood and will be hard to put into practice. As it is,

(Concluded on Page 72)

Current Shop Welding Practices

By J. C. HOLMBERG
Chief Metallurgist,
Struthers-Wells Co., Warren, Pa.

WHEN the Struthers-Wells Co. built its first fusion-welded pressure vessel in 1908 oxy-acetylene was the accepted method of welding for that type of work. Many things now taken for granted were then practically unknown. Today if the same vessel were to be built it would be constructed by schooled welders who had passed qualifying examinations. After welding, the vessel would be stress-relieved in a furnace designed and built especially for such service, and finally the accessible seams would be subjected to a thorough radiographic examination.

From the early days when welding was done by the oxy-acetylene torch to the present practice of welding with heavy-coated electrodes using amperages that just a few years ago were unthought of there has been a series of constant changes and improvements. At the present time the art of welding is so developed that a fabricator no longer hesitates when plate thicknesses of 3 and 4 in. are under consideration. Not only is mild steel boiler plate being successfully welded, but equal success is obtained with many austenitic steels, the high-chrome irons, as well as many of the non-ferrous materials and alloys, such as Everdur, aluminum, nickel and many others.

All of these fabricating demands have made the manufacturer research-conscious. He has had to help develop not only a definite welding technique for the various plate thicknesses in mild steel, but also different procedures for the many different alloys and for the new materials that are constantly being placed on the market.

In order to illustrate the procedures particularly suited to mild steel and some of the stainless alloys, several problems will be briefly discussed. First, consider the construction of a vessel using 1-in. mild steel in accordance with the A. S. M. E. code for Class 1 vessels.

Before any shell sections can be rolled it is necessary to plane the plate edges to prepare them for welding. For plate of this thickness it is best to use a modified "U" groove and this, of course, must be machined in the plate while it is flat, excepting on heads where the machining must be done after forming. After rolling the shell section, welding is started in the bottom of the groove and welding

AFTER developing and reviewing standard practices for welding and treating mild steel vessels, the author outlines welding technique for the more difficult rustless irons and steels. An enhancing feature is a large number of practical questions and answers which conclude his discussion. Mr. Holmberg presented much of the material included in this article before the Montreal chapter of the American Society for Steel Treating on Dec. 4.

beads approximately 1/10 to ⅛ in. in thickness are "laid in" until the groove is filled. Between the application of each bead, clean off the slag with a revolving wire brush, chip out any irregularities and peen thoroughly. This procedure is rigidly adhered to with the exception of the last bead, where the peening is omitted. The inside is then chipped out to sufficient depth and welded full. For this type of welding, the Struthers-Wells Co. uses a heavy flux-coated electrode developed in its own plant and designated as "Hot Rod." The name is derived from the fact that, depending on the rod size, currents often as high as 600 amp. are used.

Testing Materials

To each shell section of such a vessel a test plate is attached so as to become a continuation of the seam. These test plates remain with the vessel and are heat treated at the same time prior to testing. These test plates on a Class 1 A. S. M. E. code vessel are cut up into the following tests:

One reduced section tensile, so machined as to produce failure in the weld. This test piece, when pulled in a machine, must show a tensile strength at least equal to that of the plate.

One free bend test which, when bent cold, must show an elongation of the outer weld metal of at least 30 per cent.

One all weld metal tensile test. This test machined entirely from deposited metal must develop a minimum tensile strength of 55,000 lb. per sq. in. and an elongation in 2 in. of at least 20 per cent.

Two specific gravity tests, which are small sections of deposited metal usually so machined as to have a theoretical volume of 10 cc. These tests must have sufficient density to impart a minimum specific gravity of 7.80. This test primarily was used to indicate the quantity of foreign matter or voids present in welds, and is now used as a semi-check on the X-ray examination.

It might be of interest to mention here that the reduced section tensile tests, even though they are machined so as to aggravate breakage in the welded area, show only about 30 per cent breakage in the weld and the remaining 70 per cent fracture in the plate material. This demonstrates that the weld is generally as strong or stronger than the plate itself. This is amply substantiated by test records which often show tensile values for the weld metal of 59,000 to 66,000 lb. per sq. in., with elongation in 2 in. as high as 37 per cent. Also in the free bend tests it is not unusual to see these tests bent double on themselves without exhibiting any signs of failure.

The vessel is heat treated in a gas-fired furnace in which maximum temperature variations are less than 25 F. deg. The heat is brought up very slowly to approximately 800 deg. F., after which it is gradually accelerated until the holding temperature is reached, usually around 1200 deg. F.. Or-

dinarily it is held a minimum of one hour at this temperature plus one hour for each additional inch of thickness, after which the vessel is slowly furnace-cooled to about 800 deg. F., from which point it is either air or furnace cooled, depending upon design, specifications and weather.

After stress relieving, the vessel is ready for radiographic examination. Two tubes of a maximum capacity of 230 kilovolt peak each are used by the Struthers-Wells Co. This enables longitudinal seams to be examined in two sections simultaneously, thereby securing at one time an exograph of 34 in. of weld. The current rectification is by means of kenetrons, and the entire equipment is so designed as to be semi-automatic as to control for exposures and the variable focal distances necessitated by varying material thicknesses and vessel sizes.

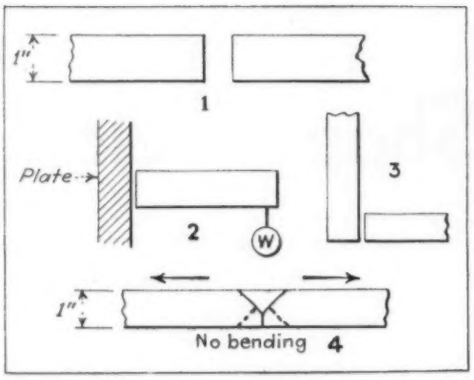
Great care should be exercised when the X-ray apparatus is in use so as to preclude the possibility of serious burns from radiation. An excellent practice is to have the men carry small pieces of dental film in their pockets which are periodically gathered and developed. This gives a constant check on whether any of the rays are leaking out, and should any film show evidence of exposure an immediate attempt should be made to locate the cause.

At the time of making the X-ray exposures a penetrometer is placed between the cassette and the material being X-rayed. This penetrometer is a step-cut piece of steel so graduated as to have variations of 2 per cent of the plate thickness. The image or shadow of this is thereby imposed upon the film and after development the inspector is able to determine accurately the seriousness of any defect that might be present.

Procedure for Rustless Steels

When it became necessary to fabricate equipment built of the rustless steels it was quickly evident that the procedures developed for the construction of vessels of mild steel could only be used as an elementary guide in the handling of these alloys and that an entirely new technique must be developed. It became a problem for the chemist, metallurgist and engineer to develop a dependable process and procedures.

The preparation of these materials for welding requires extreme care and inspection. As the physical properties of these alloys are different and the price is considerably more than that of mild steel, vessels constructed from these alloys are, as a rule, of much lighter gage. These materials are usually under ¾ in. in thickness, and these thinner sections best lend themselves, as to groove preparation, to an approximate 30 per cent bevel instead of the modified "U" used on steel.



Various welding problems and recommended procedures are illustrated on the opposite page. (1) If straight-gap welding is not preferred, how would the plates be prepared before rolling, and how would the welding be carried out? (2) What would be the best weld if the cantilever is to carry a varying load at the end? (3) What would be the most suitable weld for a right-angle joint subjected to internal pressure? (4) Two plates which will not be subjected to bending; what type of joint should be used?

There is still another good reason for using this type of groove, especially on the stainless irons having a chromium content of 15 to 18 per cent. In this material the deposited weld metal when freezing has a natural tendency to crystallize in large dendrites. This structure is exceedingly strong when tension is applied in a line parallel to the axis of these dendrites. However, unfortunately in any welded construction the tension will never be so applied but will, instead, be at right angles to the weld which is the weakest plane.

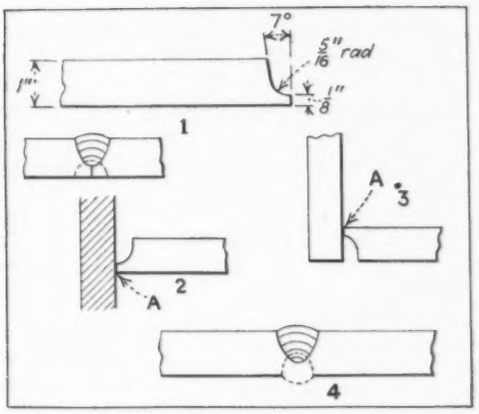
By using the "V" type groove, small electrodes and numerous layers of welding, it is possible to so modify this natural structure that the weld metal is semi-stratified and resultingly stronger. It is possible with these 18 per cent chrome iron welds to secure tensile values of 65,000 to 70,000 lb. per sq. in. with fracture usually occurring in the plate and not the weld, and free bend values up to 180 deg. with a radius equal to one-half the plate thickness. These values are obtained only after suitable heat treatment.

The heat treatment of the chrome irons has been carefully developed. The two major items that retarded fabrication of this material were lack of proper welding procedure and proper heat treatment. Both of these problems have been solved, although there is still a considerable difference of opinion as to the best practice.

In the Struthers-Wells plant the procedure is to heat to about 1450 deg. F., holding at this temperature for a minimum of 3 hr., and then to cool very slowly. This differs from the practice of others who advocate rapid cooling from the holding temperature, followed by a "drawing" temperature of approximately 1200 deg. This latter treatment is assumed to increase considerably the impact values. However, our findings have been that we do not secure as good ductility or fatigue resistance by this treatment as through the simpler single heating.

The more common grade of rustless steel used in welded construction is the chromium-nickel series, of which 18-8 is the best known. This type of material, being of an austenitic nature, is extremely tough and ductile even prior to heat treatment. Although these alloys exhibit unusually fine physical properties, they do, under certain conditions, have a tendency toward what is commonly termed "weld decay." When these 18-8 alloys are heated to a temperature of approximately 1000 to 1500 deg. F. and maintained at this temperature for a sufficient length of time, the carbon tends to precipitate out of solution and deposit along the grain boundaries in the form of carbides. These carbides do not exhibit the same corrosion resistance as does the material within, where precipitation has not occurred.

In welding, the metal deposited and the joint itself are heated to the melting or fusion point of the alloy, which is approximately 2700 deg. F., while the rest of the work remains cold. This results in a zone parallel to and near the weld which has been heated to the danger zone and in which carbide precipitation has probably occurred. This area can be wide, narrow, near, or at some distance from the weld, depending entirely upon the welding procedure. If the welding be rapid this area will be relatively near the weld and narrow, while if slow, it will likely be wide and farther removed from the weld. The carbide can be put back into solution by proper heat treatment. Our practice is to heat to 1950 deg. F. and after thorough soaking at this temperature, to cool as rapidly as possible.



Recommended welding procedures for the solution of the problems on the opposite page. (1) Typical plate preparation is shown, and welding is done along the full lines. Chip out as shown by dotted line, and weld full. (2) and (3) Weld groove, then chip out at A and weld full. (4) All 1-in. mild steel plates are prepared and welded as shown. Weld beads as shown by full lines, then chip along dotted line and reweld.

Practically all the rustless steel manufacturers have been working on the problem of carbide precipitation to determine some means of securing greater stability and thereby eliminate the necessity of heat-treating structures fabricated of this alloy. Some of the steel makers have added various additional alloys, such as titanium, vanadium, molybdenum, columbium, etc., with every manufacturer setting forth certain claims of superiority. Of all these, judging from what data are available, it is hard to advance a definite answer, although columbium presents interesting possibilities because of the fact that it is not lost during the welding operation and is recovered in the deposited weld metal.

Reducing Carbide Precipitation

Another theoretical improvement in the stabilizing of the 18-8 alloys that appears to have practical merit is to increase the chromium content to a minimum of 19 per cent and the nickel to a minimum of 9 per cent. The Struthers-Wells Co. recently conducted tests on some plate that analyzed 19.72 per cent Cr and 9.52 Ni. This material was welded with electrodes that were sufficiently high in chromium so that after the welding operation the deposited weld metal was of practically the same analysis as the plate. These welds were not heat treated. Standard Huey corrosion tests, when cut from these specimens and subjected to boiling nitric acid for periods of 48 hr., showed corrosion losses of only five ten-thousandths of an inch penetration per month. There was very little carbide dissociation when examined under the microscope and the physical properties were entirely satisfactory.

The use of these austenitic rustless steels will be extended greatly when suitable analyses are established that will permit proper construction and eliminate the necessity of heat treating. This particularly applies to vessels that cannot now be built and shipped due to the limitations of transportation. If these could be partly formed and welded in the shops, and the various component parts shipped to their destination where finish assembly and welding could be done, it would add materially to the usability of these materials.

Quite often vessels of fairly light construction must be so designed that they have large flat surfaces. If these vessels are heated to the high temperatures required to properly heat-treat the 18-8 alloys, warping and deforming will invariably occur. This not only destroys the appearance of the vessel but quite often has a deleterious effect upon its purpose.

When first introduced commercially the rustless steels were heralded as a panacea for all the corrosion ills of industry. The result was, in many instances, disastrous, as materials of an analysis entirely unsuited for certain services were used to the detriment of the entire rustless field. However, thanks to thorough research work, many hazards are being eliminated, and a broadened field of application will doubtless ensue.

The following questions were advanced by various persons interested in modern welding procedures. The answers are the result of experiences of others and the results of work in the Struthers-Wells shops.

Questions and Answers

Q. (1) What is the difference, if any, between the steel in coated and uncoated rods? (2) Why are coated rods three to four times as expensive as uncoated rods?

A. (1) The bare rod material for coating is usually the same specification as rods for bare wire welding. These rods are bought in accordance with the American Welding Society specifications, which call for 0.15 to 0.18 carbon content. (2) Coated rods are considerably more expensive than the uncoated for reasons which include the material cost of the coating itself, development of new rods, marketing, stocking and advertising.

Q. If a defect is chipped and rewelded, is the reweld heat-conditioned?

A. The reweld should always be heat-treated. Every precaution, however, should be made to prevent defects, in order that treating costs be not excessive.

Q. (1) What is the Cr and Ni content of welding rod for 18-8? Are these elements in the rod or flux coating? (2) Does high wattage burn out alloying elements on welding?

A. (1) Chrome-nickel contents are commercially the same analysis as the plate. Cr content should be about 1 to 1½ per cent higher than plate, as some Cr is lost through oxidation during the welding operation. Usually, the coating is not changed for various slight revisions of the analysis of the rod material. (2) High current values do burn out readily oxidized alloying elements in the material. This is particularly noticeable in the Cr content as explained above.

Q. Why is not the last bead in the welding of heavy plate peened?

A. It is omitted primarily for economical reasons. No welding operation follows, and after heat treatment the slag inclusions are sufficiently removed to present a good appearance.

Q. Is a short or a medium to long arc preferable for shielded arc welding?

A. This depends on the type of rod used. Organic type of rod can be used with a long arc if so desired. Mineral type rod should be used with a short arc, in order to reduce nitrogenizing of the weld metal.

Q. If columbium is used in welding material for stainless steels, what is the columbium content?

A. The columbium content of the plate made by Allegheny Steel Co. is under 2 per cent.

Q. (1) Is the weld metal deposited so as to have residual carbon and manganese higher than parent plate in order to secure higher strength? (2) To stress-relieve a plain-carbon pressure vessel, is it possible to obtain proper results at lower than normal temperature if period of soaking is materially lengthened?

A. (1) The weld material analysis is usually quite comparable to that of the plate. Manganese content is sometimes increased to get much higher tensile strengths. (2) There is un-

questionably great merit in the theory that a long soak at a slightly lower temperature will do fully as well as shorter soak at normal temperature; this temperature difference is considered to be around 200 F. deg.

Q. What heat treatment is given after welding tubes and sheets of 18-8, KA2, KA2s, for service at 100 lb. per sq. in. and 300 to 325 deg. F.?

A. All are given the same heat treatment, i. e. minimum of 1950 deg. F., soaked thoroughly and cooled as rapidly as possible.

Q. What is best method of using stainless wire (martensitic) overhead as overlay or thin corrosion-protective coating; base metal to be SAE 1030-1035 steel casting? Should electrode be bare or coated? What is best diameter of electrode?

A. At all possible times use down-hand welding, as overhand welding is at best only a substitute for the better way of down-hand welding. Electrodes should be coated, and have diameter of ⅛ in. Diameter dependent upon service conditions and area to be covered.

Q. How should the analyses of electrodes compare with that of the plate for welding mild steel? How does cost of welded pressure vessel compare with similar vessel prepared in the conventional manner? For what reason is the U-groove preferred to the square-edge gap?

A. For best results electrodes for welding mild steel should, as a rule, be of practically the same analysis as the plate. Vessels for equal service will, as a rule, cost less in welded construction than riveted construction. The use of the U-type groove does away with the use of a backing up strip. The U machining prevents the welding against acetylene cut edges and thereby insures a superior weld.

Q. Can cast iron be welded, and what type of rod is used?

A. Truly welded cast iron is generally very unsatisfactory. It is better to braze the material, or to "stud" it and then weld to the studs. This, at its best, however, is only a makeshift and is not a true weld.

Q. What is the best method of welding high-carbon (30/40) steels?

A. The best method is to use numerous beads of relatively thin cross-sectional area. If the material is quite thick, it is best to stress-relieve by annealing at intervals during the welding operation.

Q. What effect has 0.2 to 0.3 per cent silicon in steel plate welding?

A. Opinion is somewhat divided. We have found that the silicon content makes little difference in the weldability.

Q. Why anneal a vessel twice?

A. If the section is 2 in. thick or more, it is good practice to relieve shrinkage strains of welding by annealing at least once during welding operation prior to the final anneal.

New Blast-Furnace Tuyere

AFTER extended research and repeated trials, under laboratory as well as blast furnace operating conditions, Freyn Engineering Co. announces an improved refractory-nose tuyere, known as the Beaton-Ledbetter tuyere, which is highly resistant to conditions and materials at the furnace tuyere zone in adverse as well as normal operation. The tuyere combines features of the Beaton tuyere with those of the Ledbetter tuyere, which was developed at one of the plants of the Tennessee Coal, Iron & Railroad Co. To this combination have been added improvements which were developed during the past two years of investigation.

An outstanding feature is the refractory nose. It employs refractory material that is chemically neutral to blast furnace slag, that otherwise would result in slow erosion by the slag. Also metallic oxides that are easily reducible in the presence of iron, carbon and carbon monoxide gas are absent. The copper nose walls thus remain protected, making the tuyere resistant to wear back to the water jacket.

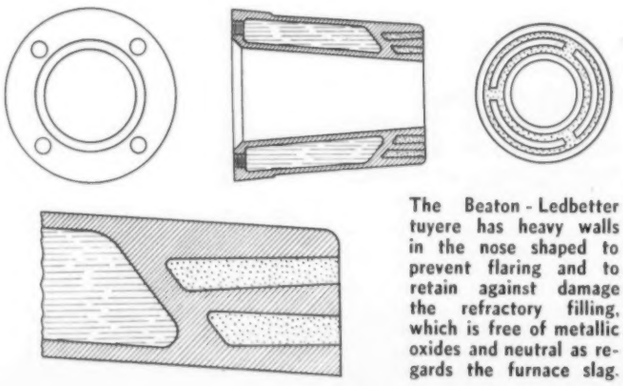
The Beaton-Ledbetter tuyere, it is emphasized, preserves its original length and nose profile not only because of the kind of refractory material in the nose, but also on account of the heavy walls now used on the nose. The third or middle wall serves to retain the refractory and protect it against mechanical damage, as indicated in drawing below.

The point urged is that a tuyere with a light exterior nose wall is likely to flare after severe service, thereby making the tuyere difficult to remove from the furnace. For this reason the outside wall of the new tuyere is made heavier than heretofore. Likewise, the inner wall is thicker to permit the tuyere to be pulled for changing size without distorting the nose profile with the pulling hook or dolly. Under operating conditions the new tuyeres have been pulled and used again without damage. Some have been pulled a second time and are still in usable condition.

The water chamber has been given stream-lining to promote water circulation and to eliminate air-bound spaces for air or steam to collect.

The Beaton-Ledbetter tuyere may be obtained from the following licensees: Dixie Bronze Co., Birmingham; Hodgson Foundry Co., Smeeth-Harwood Co., both of Chicago; Lawrenceville Bronze Co., National Bearing Metals Corpn., both of Pittsburgh, and the Falcon Bronze Co., Youngstown, Ohio.

"Industrial Radiography," by Ancel St. John and H. R. Isenburger, just published by John Wiley & Sons, Inc., New York, presents in readable form authoritative information concerning the practical use of radiography for industrial service. The St. John X-Ray Service, Inc., has long been a leader in the development of new radiographic methods, and the two authors are particularly well qualified to discuss the development and use of routine methods for rapid and economical inspection in large and small-scale commercial operations. The authors sketch the inception and growth of X-ray and gamma-ray technology, and treat the theoretical aspects in a semi-technical manner, but dwell with particular emphasis on data and practices which can be immediately useful in the shop. There are included many tables, graphs and charts which greatly facilitate the estimation of costs, determination of exposure times and the evaluation of exographs and gammagraphs.



The Beaton-Ledbetter tuyere has heavy walls in the nose shaped to prevent flaring and to retain against damage the refractory filling, which is free of metallic oxides and neutral as regards the furnace slag.

New Self-Contained Motor-Driven Drop Hammer

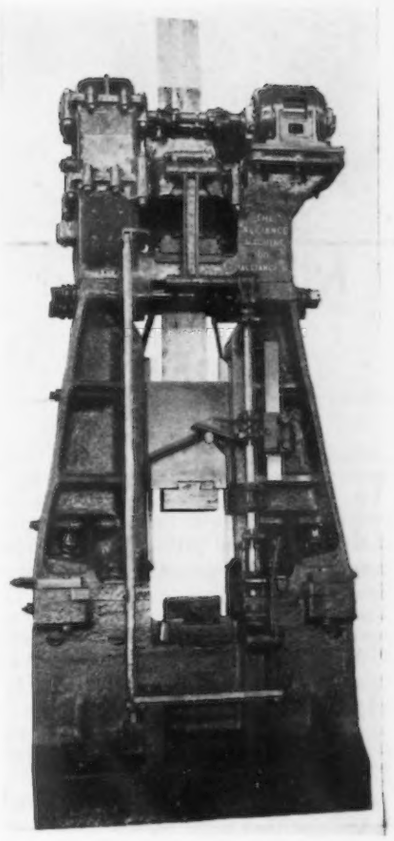
ADVANTAGES of individual motor drive for board drop hammers are stressed by the Alliance Machine Co., Alliance, Ohio, in bringing out a new line of hammers that are driven by a motor mounted on the machine. A hammer with the individual motor drive, it is pointed out, may be placed anywhere in a shop regardless of its position in reference to lineshaft, building columns and roof trusses, permitting a more flexible and economical grouping of tools. With no belting belt pull is avoided and it is not necessary to stay the hammer to the building. The elimination of the belt pull and belt slap results in longer life in the frame-to-anvil connections and assures greater accuracy in the forging produced.

More blows per minute it is claimed, may be struck with the motor-driven board drop hammer than with a belt-driven machine and on short strokes it will strike more blows per minute than a steam drop of equal size.

Refinements in design intended to increase the speed of the machine and materially reduce maintenance costs have been incorporated in the hammer. The motor is full floating, being mounted on rubber insulators to absorb the shock. The gears are of heat-treated steel and run at a very low pitch-line velocity to assure quiet operation. The gears are inclosed and are lubricated by a splash system. The roll and gear shafts, of heat-treated alloy steel, are mounted on heavy-duty roller bearings having hardened and ground inner and outer races. The rams and anvil caps are of heat-treated forged steel.

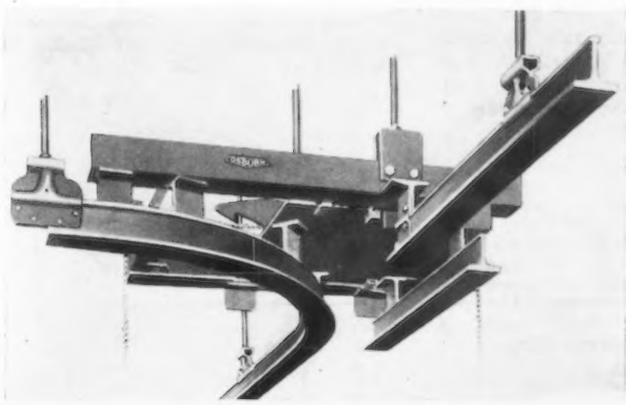
The board clamp as well as the foot treadle are full floating, the latter being flexibly mounted on rubber insulators to relieve operator of fatigue. Roll adjustments of ⅜ to ½ in. may be made without roll gear interference. The rolls are of large diameter and are thoroughly ventilated. The ratio of lift to load and roll pressure per sq. in. is said to be practically equal on all sizes. Pin connections not mounted in rubber are bronze bushed and lubricated by a pressure grease gun. The friction bar is of heat-treated alloy steel. All parts attached to this bar may be removed or replaced without removing the bar from top connections. The frame is an annealed cast steel I-beam section.

The hammer is made in sizes from 450 to 6500 lb. falling weight. The 1500 to 6500 lb. hammers have long multiple inserted reversible forged steel ram guides. The nut pockets and bolt holes are machined from solid metal to relieve internal casting stresses. These sizes use cast steel anvils with 20 to 1 ratio. They are designed with ½-in. wedge cross attachment for die alinement and incorporating full length wedge bearing on both the frame and anvil. The 450 to 1000 lb. sizes have a ratio of 16 to 1 and have a semi-steel anvil with bolt cross adjustment for die alinement.



Tramrail Sliding Switch

A TRAMRAIL sliding switch, shown in the illustration, has been brought out by the Osborn Mfg. Co., Cleveland. In operation a sliding plate to which the curved section and the straight section of the T-rail are welded moves to either position of the switch on four rollers mounted on the switch frame. A latch at either end of the upper side of the sliding plate keeps the switch locked in position. To throw the switch the chain attached to the lock latch is pulled to release the latch and to roll the switch into the other position. The other latch locks the switch.



▲ ▲ ▲

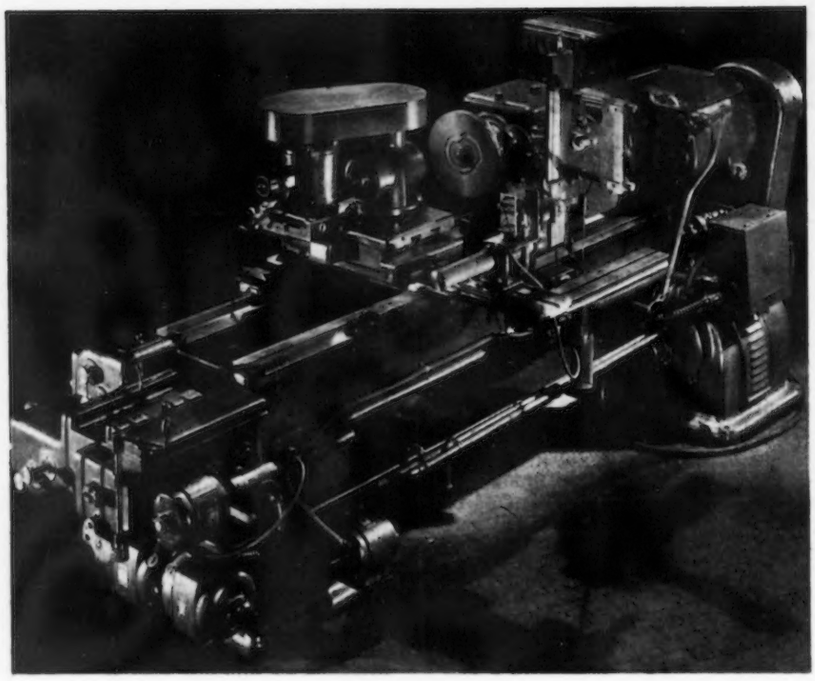
A sliding plate to which the curved section and the straight section of the T-rail are mounted facilitates switching. The necessity for superstructure is minimized and few supporting fittings are required.

▼ ▼ ▼

Advantages claimed for the Osborn tramrail sliding switch follow: It minimizes the necessity for superstructure; few supporting fittings are required; there are few holes to drill; bending and fitting curves to the switch are eliminated, as well as angular rail cuts; erection time and head room loss are lowered; construction is rigid; latching is positive; the carriage is easy rolling, and the switch is foolproof. It is made in capacities up to 3 tons. Both the Osborn T-rail and Beamrail with standard jig-drilled ends may be fitted to the switch without further drilling or cutting in the field. The switch permits the spacing of spur tracks as close as 30 in.

The Birmingham section of the American Society of Mechanical Engineers, with the American Foundrymen's Association cooperating, will hold a meeting on "Foundry Practice" Feb. 19 and 20. The program includes visits to various plants, technical papers and discussions, and luncheon at the plant of the Sloss-Sheffield Steel & Iron Co.

Cam Milling Attachment For Monarch-Keller Lathes



THE Monarch Machine Tool Co., Sidney, Ohio, has developed a cam milling attachment for its Monarch-Keller controlled lathe. This attachment, in combination with the centrode device and oval chuck described in THE IRON AGE of March 16, 1933, is emphasized as resulting in an unusually universal machine tool. It is adapted for milling face cams up to 23 in. in diameter and barrel cams up to 12 in. in diameter; also single or double-track cams and other irregular contour work from a master template.

The attachment consists of a sub-headstock that bolts on the lathe bed, directly in front of the regular headstock. It is driven by silent chain from a sprocket bolted to the flanged spindle nose of the regular headstock. A completely universal milling fixture fits on the lathe carriage in place of the regular compound rest.

The milling headstock has a worm-drive spindle giving a 450-to-1 reduction from the spindle speeds provided in the main headstock of the lathe. As the spindle nose on the milling headstock is identical with the flanged spindle nose on the headstock proper, all chucks, plates and fixtures are interchangeable. The cam milling attachment may be quickly mounted, and quickly removed to make the lathe available for automatic form turning or for regular engine lathe work.

Precision Timken bearings that operate in oil are provided for the milling spindle. This spindle may be swiveled to any angle and has a No. 9 B & S taper to take various end mills. It is driven by a 1-hp. a.c. motor, which is mounted vertically on a movable bracket on the carriage to keep the V-belt in proper tension. Three-groove V-belt pulleys are provided. They may be interchanged between the motor and milling spindle to give milling spindle speeds of 200, 315, 485, 700, 1090 and 1700 r.p.m.

Templates for cam milling are made from approximately 1/16-in. thick zinc or other soft metal and are 12 in. long. They are laid out in a flat plane, and the template travels its length, 12 in., to one revolution of the work. When the work has made one complete revolution, a precison contactor switch disconnects the current to the magnetic clutch that drives the milling headstock spindle. The swing of the milling headstock over the bed is 28½ in.

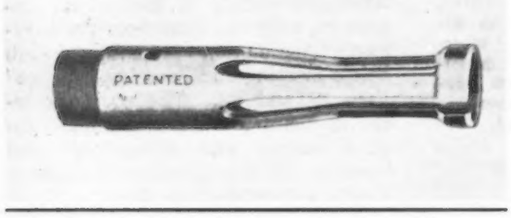
Screw Machine Stock Pusher and Finger Holder

THE MODERN COLLET & MACHINE CO., Ecorse, Mich., is offering the screw machine stock pusher and the equalizing finger holder here shown. Alloy steel cams for screw machines are also manufactured.

The stock pushers can be tightened when they become worn; when the fingers wear or become loose, a light tap on the upper part of each rib is all that is required to restore the original tension. The same pusher can be used on round and hexagon stock or on round or square stock.

A feature of the equalizing finger is distribution of the load over three points instead of only two, as usual. The spherical plate adjusts itself so that each finger has an equal load, regardless of how the finger wears or the stock gets out of round. This is said to eliminate finger breakage to a large extent, and to make the machine chuck easier.

The alloy steel cams, made from S.A.E. No. 6145 steel, are toughened to absorb shocks and give longer life.



The stock pusher shown at left can be used for round and hexagon stock or for round and square stock. When worn, it can be tightened. The new equalizing finger holder is shown at right.

THE NEWS OF THIS WEEK

Wholesale Prices For Week Ended Feb. 3

"FURTHER strengthening of market prices of farm products and foods was largely responsible for the continued rise in wholesale commodity prices two weeks ago," Commissioner of Labor Statistics Lubin of the U. S. Department of Labor announced. "The advance is the sixth consecutive weekly rise in wholesale prices and placed the index number 72.8 per cent of the 1926 average as compared with 72.4 per cent for the week ending Jan. 27," Mr. Lubin said.

"The index of the general level, which rose by six-tenths of 1 per cent over the previous week, registered an advance of 1½ per cent over the high point reached during last year, when the index stood at 71.7 for the week of Nov. 18. Present prices are 21½ per cent above the corresponding week of a year ago, when the general index stood at 60.0. As compared with the low point of the year 1933 (week ending March 4), when the index was 59.6, the current index is up by slightly more than 22 per cent, and places the general level 23½ per cent under the average for the year 1929, when the index number registered 95.3.

"Eight of the ten major groups of items covered by the Bureau showed an increase, with only two groups, fuel and lighting and chemicals, recording fractional declines. The increase was more general than it has been for several weeks, with 92 items, or more than 11 per cent of the total number covered, advancing during the week and only 32 showing a decrease. The remainder of the 784 items remained at the level of the week before."

The index number of the Bureau of Labor Statistics is composed of 784 separate price series weighted according to their relative importance in the country's markets and is based on average prices for the year 1926 as 100.0. The accompanying statement shows the index numbers of the major groups of commodities for the past two weeks, for one year ago, for the low point of 1933 and the average for the year 1929.

INDEX NUMBERS OF WHOLESALE PRICES FOR WEEKS OF FEB. 3 AND JAN. 27, 1934, FEB. 4 AND MARCH 4, 1933, AND YEAR 1929

(1926=100.0)

	Week Ending				
	Feb. 3, 1934	Jan. 27, 1934	Feb. 4, 1933	March 4, 1933	Year 1929
ALL COMMODITIES	72.8	72.4	60.0	59.6	95.3
Farm products	60.5	59.5	40.2	40.6	104.9
Foods	65.7	65.0	53.6	53.4	99.9
Hides and leather products	90.5	90.4	68.3	67.6	109.1
Textile products	76.5	76.4	51.4	50.6	90.4
Fuel and lighting materials	73.9	74.0	64.7	64.4	83.0
Metals and metal products	85.1	84.7	78.1	77.4	100.5
Building materials	86.4	86.2	70.0	70.1	95.4
Chemicals and drugs	75.0	75.1	71.8	71.3	94.2
Housefurnishing goods	81.8	81.7	72.8	72.7	94.3
Miscellaneous	68.4	68.1	60.8	59.6	82.6
All commodities other than farm products and foods	78.7	78.5	66.8	66.2	91.6

Industrial Machinery Exports Decline

UNITED STATES exports of industrial machinery in 1933 registered a decline of 6 per cent as compared with 1932, according to figures compiled in the Commerce Department's Machinery and Agricultural Implements Division.

Aggregate sales abroad of such products during the past calendar year were valued at $55,282,687 against $58,490,503 in 1932. The 1933 total was approximately 68 per cent under the 1931 figure, it is pointed out.

Increased exports during 1933 were recorded in only two classifications, namely, "mining, well and pumping machinery" and "textile, sewing and shoe machinery." Shipments of the former reached a total of $13,500,000, a gain of 28 per cent over the preceding year's figure, while the total for the latter, amounting to $9,825,000, was 4 per cent in excess of the 1932 total. Exports of textile machinery alone were valued at $4,860,000 in 1933, a gain of approximately 13 per cent over the preceding year.

The greatest loss recorded for industrial machinery exports in 1933 occurred in power-driven metal working machinery, the 1933 total of $8,158,000 being 32 per cent under the 1932 figure. Of the remaining classes, exports of power-generating machinery, except electric and automotive, decreased 23 per cent, total exports amounting to $3,845,000 in 1933; construction and conveying machinery exports valued at $2,813,000 were nearly 27 per cent under the 1932 total.

Other metal working machinery and other industrial machinery showed export valuations in 1933 of $1,211,000 and $15,926,000 respectively, the former being 24 per cent under the preceding year's total and

the latter showing a negligible decline.

The above figures suggest that machinery exports are now at the lowest point of the depression, but if monthly figures are used instead of annual figures very substantial recovery is shown. The peak of these exports occurred in March, 1929, at $25,645,339. The recent low was in May, 1933, at $3,400,060. Since that time there has been almost consistent improvement, the high being in November at $6,743,348. December was just a little lower at $6,317,808, figures which suggest that substantial improvement has been made since the low point of the depression was reached early last year.

Aircraft Manufactured During 1933

A TOTAL of 1324 airplanes was manufactured in the United States during 1933, of which 677 were for domestic civil use, 331 for military delivery, and 316 for export. These figures were announced today by the aeronautics branch of the Department of Commerce.

The 677 airplanes built for domestic civil use during the year included 506 monoplanes, 164 biplanes and 7 autogiros. Of the monoplanes, 246 were open cockpit and 260 were cabin types. The biplanes included 51 open cockpit and 113 cabin aircraft.

In 1932, the number of airplanes produced was 1396, of which 667 were for domestic civil use, 500 for military delivery, and 229 for export. Among the 667 airplanes manufactured for civil use were 481 monoplanes, 165 biplanes, and 21 autogiros.

Steel Corporation's Shipments Off Sharply

SHIPMENTS of finished steel products by the subsidiary companies of the United States Steel Corpn. declined sharply in January, amounting to 331,777 tons, as compared with 600,639 tons in December. Shipments in January, 1933, were 285,138 tons.

Activities of Cleveland Chapter of A.S. for M.

NATIONAL Officers' Night was observed by the Cleveland Chapter of the American Society for Metals, Feb. 12. Welcome was extended to William H. Phillips, vice-president, Molybdenum Corpn. of America, Pittsburgh, and president of the society, who outlined plans and activities of the society for the current year. William H. Eisenman, national secretary of the society, also spoke. Guests included W. S. Bidle, J. V. Emmons and Dr. Zay Jeffries, Cleveland, past national officers. The technical address of the evening was delivered by Robert S. Archer, director of metallurgy, A. O. Smith Corpn., Milwaukee, who discussed recent metallurgical research, gases in steel and cast iron and economics of iron castings vs. steel forgings.

The Cleveland Chapter of the American Society for Metals will give a series of eight educational lectures on Applied Metallurgy, which will be presented by Harry B. Pulsifer, chief metallurgist and chemist Ferry Cap & Set Screw Co., Cleveland. The series will start Feb. 26, and one will be presented each week.

British Iron and Steel Exports and Imports

BRITISH exports of iron and steel products in 1933, amounting to 1,923,802 gross tons, were 35,224 tons in excess of the 1932 figure, according to figures compiled in the Commerce Department's Iron and Steel Division.

The trade in many British specialties, such as black plates and sheets, galvanized sheets, and tin plate was smaller than in the preceding year, the report points out, and it was only because of an improvement in the showing in tubular products and rails that the aggregate export gain was possible.

Tin plate continued to be the leading product in Great Britain's iron and steel export trade, total shipments in 1933 amounting to 453,199 tons. Other outstanding items in the trade from the standpoint of tonnage were galvanized sheets, amounting to 275,879 tons; plates, 243,513 tons; and wrought pipe, 187,041 tons.

British imports of iron and steel items, comprising mainly the products of Continental manufacture, totaled 964,796 tons in 1933, a decline of 627,447 tons compared with 1932. The principal commodity imported was steel ingots, total receipts of which amounted to 317,576 tons; the second largest import item was steel bars, receipts of which totaled 229,674 tons. Pig iron to the extent of 121,406 tons was also brought in, as was 78,979 tons of hoops and 77,118 tons of structural steel.

Production of pig iron in the United Kingdom totaled 4,123,600 tons in 1933, an increase of more than 15 per cent over the preceding year. British steel products in 1933, amounting to 7,006,500 tons, were approximately 35 per cent in excess of the 1932 figure.

Export Association Backs Foreign Trade Bank Idea

ACCORDING to a statement by Harry Tipper, executive vice-president, the American Manufacturers Export Association discussed fully at its recent board of directors' meeting the announcement by Mr. Jesse Jones, chairman of the Reconstruction Finance Corporation, regarding the formation of a foreign trade bank to provide intermediate and long-term credit and insurance. The directors approved the program in principle as one agreeing with those for which the Association has actively worked for a long time.

The plan advocated by the American Manufacturers Export Association covered all the important elements now included in the proposed R.F.C. institution. The provision of all capital by the Government instead of a combination of private and Governmental capital in no way changes the value of such a credit institution properly manned and managed in the interest of all concerned.

The A.M.E.A. has been advocating such an institution since 1919 and for the last two years has been working on plans that would bring the matter into a practical operation. The steps toward providing these facilities, therefore, are welcomed by the directors as progress in the development of American export and import business.

MONTHLY SHIPMENTS OF STEEL PRODUCTS BY UNITED STATES STEEL CORPN.
(In Net Tons)

Month	1930	1931	1932	1933 Shipments	1933 Per Cent of Capacity	1934 Shipments	1934 Per Cent of Capacity
January	1,104,168	800,031	426,271	285,138	17.7	331,777	19.8
February	1,141,912	762,522	413,001	275,929	18.5	.....	...
March	1,240,171	907,251	388,579	256,793	15.3	.....	...
April	1,188,456	878,558	395,091	335,321	21.6	.....	...
May	1,203,916	764,178	338,202	455,302	27.1	.....	...
June	984,739	653,104	324,746	603,937	37.4	.....	...
July	946,745	593,900	272,448	701,322	45.1	.....	...
August	947,402	573,372	291,688	668,155	39.8	.....	...
September	867,282	486,928	316,019	575,161	35.6	.....	...
October	784,648	476,032	310,007	572,897	35.5	.....	...
November	676,016	435,697	275,594	430,358	26.7	.....	...
December	579,098	351,211	227,576	600,639	38.7	.....	...
Less yearly adjustment	(40,259)	(6,040)	(5,160)	.....	...	.....	...
Total for year	11,624,294	7,676,744	3,974,062	5,760,952	...	.....	...

N. A. C. A. Suggests Code Cost Provision

A REPORT has just been issued by the National Association of Cost Accountants suggesting a standard wording for the selling below cost provisions in industrial codes.

The suggested wording is as follows:

It shall be an unfair method of competition for anyone coming under the provisions of this Code to sell or exchange products or services at a price or upon such terms and conditions as will result in the customer paying less than the fair and reasonable cost, as determined on the basis of a system of cost accounting to be formulated by the Code Authority.

Cost is defined for this purpose as the sum of material or merchandise at current replacement cost, plus actual wages for direct and indirect labor, plus factory burden distributed on a basis of utilization of plant facilities for the industry as recommended by the Code Authority, plus selling, advertising, administration, warehousing, transportation, collection and all other costs and expenses involved in selling, distributing and delivering the merchandise, including burden or expense allowances for depreciation and/or depletion and/or obsolescence and/or amortization, computed according to the rates and upon bases acceptable for Federal Income Tax purposes.

Provided, however, that sales below cost may be made to meet the prices of competitors who do not violate the Code.

(Exceptions—Peculiar to a Particular Industry, such as Seconds, Dropped Lines, Etc.)

This suggested wording is offered subject to the following conditions:

In no event should a definition of cost produce less than the total delivered cost.

The cost accounting questions involving methods of distributing overhead, absorbing fixed charges, including interest on investment, and other debatable points, should not be comprehended in the Code but should be worked out by the particular Code Authorities. The question of how to apply sales, administrative and all of the other expenses which are so difficult of apportionment can well be a matter to be determined by the industry itself, with Government approval, and in all probability, if done uniformly, will substantially serve the purpose.

The making of this recommendation does not imply any opinion as to the practicability or the impracticability of this clause to accomplish: a. minimum selling prices; or b. cost reduction.

In making this recommendation, no consideration has been given either for or against the clause granting exceptions. It is included as a practical consideration in obtaining agreement among all the members of the industry rather than as a justifiable principle in theory.

Victor H. Stempf, of Touche, Niven & Company, president of the New York Chapter, stated that it was not the intent or desire of the National Association of Cost Accountants to dictate a standard or model provision to the NRA authorities. The purpose of this suggestion is merely to propose a standard or model wording expressing the ideas of qualified authorities in the industrial accounting field which may be used as the basis for the development of cost provisions for individual industries.

N. M. T. A. Warns of Thirty-Hr. Week Cost

NATIONAL Metal Trades Association, reviewing the salient features of the 30-hr. week bill recently introduced in Congress, points out that:

"A study by the National Industrial Conference Board made in January of this year shows that with average employment in manufacturing on the 1929 level, approximately 9,000,000 wage earners would now be employed in the manufacturing industry. At the business level for October, 1933, with men working an average of 35.8 hours per week, there would be 2,314,000 wage earners unemployed. If the hours were reduced to 30 hours a week, only 1,293,000 more would be actually employed, leaving over 1,000,000 still unemployed. Therefore, the average hours per week would have to be reduced to 26.6 hours to take up all of the slack employment in the manufacturing industries. If this were done, the average wage per man hour, which has risen from 42.7 cents in July, 1933, to 52.5 cents by October, 1933, would, on the basis of the 30-hour week, rise to 62.7 cents. On the 26.6-hour basis, the average rate per man hour would rise to 70.7 cents. In the meantime, the Conference Board points out that it should be noted that manufacturing output in October, 1933, measured in man hours had not been maintained on the July, 1933, basis, and it is evident that industry, operating on a very narrow margin of profit, cannot bear the increased labor costs without increasing the price of its products. Moreover, it is explained that the increased prices in many cases have made it difficult for manufacturers to maintain the sale of their products. The question is—Can private industry carry the further burden that would be involved in a 30-hour maximum week with the present output of industrial goods?

"We believe that every manufacturer should immediately write to his representatives in Congress telling them how this proposed measure, if enacted into law, would affect his business. He should also write to Mr. Wm. P. Connery, Jr., Chairman of the House Labor Committee, which committee is now holding hearings on this bill."

Russell Co. to End Receivership

STOCKHOLDERS of the Russell Mfg. Co., Middletown, Conn., have authorized the newly elected board of directors to take steps for the termination of the company receivership. G. M. Williams is the newly elected president.

Directors elected are as follows: T. Macdonough Russell, Arthur P. Day, Henry K. W. Welch, Allan Forbes, S. St. John Morgan, Fred W. Sibley, G. M. Williams, Marshall N. Jarvis and J. Harold Williams.

Nebraska Manufacturers Ask Compensation Survey

NEBRASKA Manufacturers' Association plans to ask the Nebraska Legislature, at its next session, to fix workmen's compensation rates for that State. In a resolution adopted by the association, it is alleged that the cost has increased to the point where the burden is too great to be borne, and that the State should aid by limiting rates to the same level as in other States.

Alloy Casting Code In Effect

THE code of fair competition for the alloy casting industry was signed of Jan. 30, 1934, by Gen. Hugh S. Johnson, Administrator of the National Industrial Recovery Act.

The code became effective on Monday, Feb. 5, 1934, and copies of it may be procured at 5c. per copy from either the Superintendent of Documents, Washington, D. C., or from W. J. Parker, commissioner of the Alloy Casting Association, 7 East 44th Street, New York.

... PERSONALS ...

ALEXANDER E. WALKER, who has been assistant vice-president in charge of sales of the Republic Steel Corpn. since early 1930, has been appointed general manager of sales. He was graduated from the engineering department, University of Michigan, in 1910. He joined the Riter-Conley Co. just after completion of his college course and for almost a year was engaged in fabricated steel erection work. In 1911 he left that company to go with the La Belle Iron Works, Steubenville, Ohio, and after a brief connection with the general sales department of that company, was transferred to the Chicago district sales office. On Feb. 1, 1916, he joined the Republic company, as assistant manager of pipe sales and in 1919 was made assistant general manager of sales in charge of pipe and sheets. When the Republic sales department personnel was recast following the absorption of the Trumbull Steel Co. early in 1928, he was made assistant general manager of sales with supervision over all products of the company. In October of that year he was appointed general manager of sales of the Republic Iron & Steel Co. and assistant vice-president in charge of sales of the Republic Steel Corpn. in April, 1930.

NORMAN W. FOY, since July, 1932, Chicago district sales manager of the Republic corporation, has been appointed assistant general manager of sales, with headquarters in Youngstown. He is being succeeded at Chicago by W. J. HANNA, heretofore of the Detroit office. Mr. Foy became associated with the old Republic Iron & Steel Co. as a salesman in 1919. He was subsequently manager of the company's Buffalo, Boston, and Birmingham offices, and was made assistant Western manager of sales shortly after the formation of the present Republic Steel Corpn.

HAROLD B. RESSLER, vice-president in charge of sales of Joseph T. Ryerson & Son, Inc., at Chicago, will move to New York to take charge of the company's Jersey City plant and will maintain a close contact with the other Eastern plants at Buffalo, Philadelphia and Boston. The move is made because of the resignation of J. A. MCNULTY, former manager of the Jersey City plant, and because of the importance of this plant and the other Eastern properties of the company. Mr. Ressler has been with the Ryerson company for 30 years. He is also vice-president of the American Steel Warehouse Association.

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J. VERNER SCAIFE, JR., has been elected president of Wm. B. Scaife & Sons Co., Oakmont, Pa., succeeding his brother, ALAN M. SCAIFE, who will continue in the capacity of vice-president but who will devote a considerable portion of his time to the affairs of the Pittsburgh Coal Co., of which he has recently been elected chairman of the board. J. Verner Scaife, Jr., has been connected with the company since his graduation from Yale University in 1927 and during the past several years has been vice-president.

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CLARENCE A. YOUNG, for many years identified with the Lewis Foundry & Machine Co. and the Duquesne Steel Foundry Co., has joined the sales department of the Machined Steel Casting Co., Alliance, Ohio.

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L. P. NIESSEN has been appointed advertising manager, Cutler-Hammer, Inc., Milwaukee, to succeed FORREST U. WEBSTER, who has been promoted to manager of merchandising sales and will continue to have general supervision of advertising. Mr. Niessen has been assistant advertising manager for several years. He is at present president of the Milwaukee Association of Industrial Advertisers.

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J. S. ADELSON, chief metallurgist, Steel & Tubes, Inc., Cleveland, addressed two meetings of electrical men at the Hotel Statler, St. Louis, Feb. 6, on the "Manufacture of Electric Welded Tubing and Pipe."

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FRED W. SARGENT, president of the Chicago & North Western Railway, and SEWELL AVERY, president of Montgomery Ward & Co., have been elected to the board of Nash Motors Co., Kenosha, Wis. C. W. NASH has been reelected chairman of the board.

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L. S. HAMAKER, sales promotion manager of the Republic Steel Corpn., was the guest speaker of the Birmingham Purchasing Agents Association on Feb. 13, his subject being "Merchandising Enters the Steel Industry."

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M. E. MADDEN, general superintendent of the Alabama division of the Southern Railway, retired from service on Feb. 10 because of ill health. He has been succeeded by L. H. WOODALL, previously superintendent at Greensboro, N. C.

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H. S. COVEY, for years secretary of the Cleveland Pneumatic Tool Co., Cleveland, has retired from active business and has been succeeded by A. M. BARNER, who has been assistant secretary of the company for about 15 years.

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DR. L. C. PAN, technical director of the U. S. Research Corpn., New York, and instructor of electroplating in the College of the City of New York, has been elected a fellow of the American Association for the Advancement of Science.

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GEORGE H. CRESSLER, formerly vice-president and general sales manager of the Stacey Mfg. Co. and vice-president of the Stacey Brothers Gas Construction Co., Cincinnati, has become a member of the organization of the Graver Tank & Mfg. Corpn. He was graduated from the Sheffield Scientific School of Yale University in 1902.

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NATHANIEL B. RANDOLPH, heretofore in charge of the St. Louis sales office of the Granite City Steel Co., Granite City, Ill., has been appointed assistant general manager of sales. He is being succeeded at St. Louis by CHARLES H. DISHMAN, who was formerly located at Kansas City. RICHARD W. ORTHWEIN has been made

A. E. WALKER

N. W. FOY

H. B. RESSLER

district manager of sales, with offices at 916 Walnut Street, Kansas City.

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A. E. ALLEN, formerly vice-president of the Westinghouse Lamp Co., has been elected vice-president of Westinghouse Electric & Mfg. Co., East Pittsburgh, and will have charge of the merchandising division, which is now established as a separate operation distinct from other divisions of the company. He will have charge of all sales, manufacturing and engineering activities of this new division. Mr. Allen has been with the Westinghouse company since 1902. Until 1925, when he was made general manager of the Lamp company, later becoming vice-president, his services had been in the Electric company; first in the engineering division, and afterwards in the sales department.

D. S. YOUNGHOLM has been made vice-president of the Westinghouse Lamp Co., succeeding Mr. Allen.

Wisconsin Products at P. A. Meeting

AN industrial products exhibit sponsored by the Milwaukee Association of Purchasing Agents, will be held at the Hotel Schroeder, Milwaukee, April 3 and 4. Exhibits of Wisconsin products will be featured. The exhibit will also include goods manufactured in other states and handled through local jobbers. Albert Korsan, purchasing agent, the Globe Steel Tubes Co., Milwaukee, is general chairman. A banquet for exhibitors is planned for the evening of Thursday, April 5.

Kales Stamping Co. Now Whitehead Stamping Co.

WHITEHEAD STAMPING CO. is the new name of the Kales Stamping Co., according to a recent announcement.

The Kales Stamping Co. was organized in 1904 and was one of the pioneer makers of metal stampings and pressed metal parts.

Company officials stated that the change of name in no way affects the policies of the company or the personnel. Officers of the Whitehead Stamping Co. are J. Frazer Whitehead, president; Thomas C. Whitehead, vice-president, and George W. Schreck, secretary.

A.O. Smith Corpn. Boosts Frame Output

AUTOMOBILE frame production at the plant of A. O. Smith Corpn., Milwaukee, is rising sharply and output now exceeds 7000 units a day. The company has recalled 4500 men.

... OBITUARY ...

LAWRENCE HOWARD QUIN, editorial correspondent of THE IRON AGE in London, England, died Feb. 10, aged 66. He was long identified with the business paper field and his purview of markets covered ferrous as well as non-ferrous metals and the doings of the Continent as well as of Great Britain, so that the London correspondence in these columns gave always a dependable picture of the European situation, with succinct statements of unusual developments in Europe at the very moment of their inception. In his earlier years he was a member of the staff of the *Ironmonger*, London, but since 1913 he devoted much of his time to the Metal Information Bureau and the *Metal Bulletin*, London, which he established in that year. His numerous market letters published over the years in these columns and his weekly cables were a service highly valued by American readers.

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GUY CHASE MYERS, first vice-president, F. E. Myers & Bros. Co., Ashland, Ohio, died Feb. 6, aged 52 years.

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JOHN E. BARCLAY, for 38 years connected with the iron ore shipping department of Pickands, Mather & Co., Cleveland, died Feb. 12. He joined the company in 1896 as an office boy.

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EDWARD G. ELCOCK, president, Hansell-Elcock Co., Chicago, fabricator of structural steel, died Feb. 12 at his home in Chicago. Mr. Elcock was born in Belfast, Ireland, and went to Chicago in 1867. He assisted in the organization of the Hansell-Elcock Co. in 1888 and became its president in 1904. He was 74 years old at the time of his death.

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CHARLES A. DUCOMMUN, president of the Ducommun Corpn., died at his home in Los Angeles on Feb. 6. Mr. Ducommun had long been a leader in the steel industry on the Pacific Coast.

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FRANK W. KENNEDY, vice-president and general manager of the De Laval Steam Turbine Co., Trenton, N. J., died after a short illness at his home at Yardley, Pa., on Jan. 24. Mr. Kennedy was born at Pittsburgh in 1876. He was graduated from Princeton with the degree of civil engineer in 1898, and thereafter occupied positions successively with the Pennsylvania Railroad at Altoona, the United States Steel Corpn., at one of the Ohio subsidiaries, and the Dravo-Doyle Co., Pittsburgh. In 1908 he became general manager of the De Laval Steam Turbine Co. and in 1916 was elected vice-president. He was a director of that company and also president and director of the American Bauer-Wach Corpn., with offices in New York. Other connections included membership in the executive committee of the Machinery Builders Society and the Society of Naval Architects and Marine Engineers.

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ERWIN J. MOHR, vice-president and works manager, Gunite Foundries Corpn., Rockford, Ill., died of heart disease Feb. 6 at Madison, Wis. For many years he had been engaged in the heat treating industry at Milwaukee, and prior to joining the Gunite Corporation, he was sales manager of the Kinite Corpn., Milwaukee, for 10 years. He became identified with the Gunite company in 1930 and soon after his arrival was made vice-president and works manager, the positions held at the time of his death. He was president of the Northern Illinois Foundrymen's Association. He was born in Milwaukee in 1892.

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WILLIAM L. NIEKAMP, for 15 years president of the Beck & Corbitt Iron Co., jobbers, St. Louis, and for the last three years connected with the Terre Haute (Ind.) Heavy Hardware Co., died in the latter city on Feb. 8 of heart disease after an illness of about two weeks. Mr. Niekamp was born 56 years ago in St. Louis, where he began his business career at the age of 16 with the Globe File & Hardware Co. and continued with Beck & Corbitt when the two were merged in 1901. In 1907 he was made secretary, and in 1913 president of Beck & Corbitt. He resigned in 1928 to organize the Copeland-St. Louis Co.

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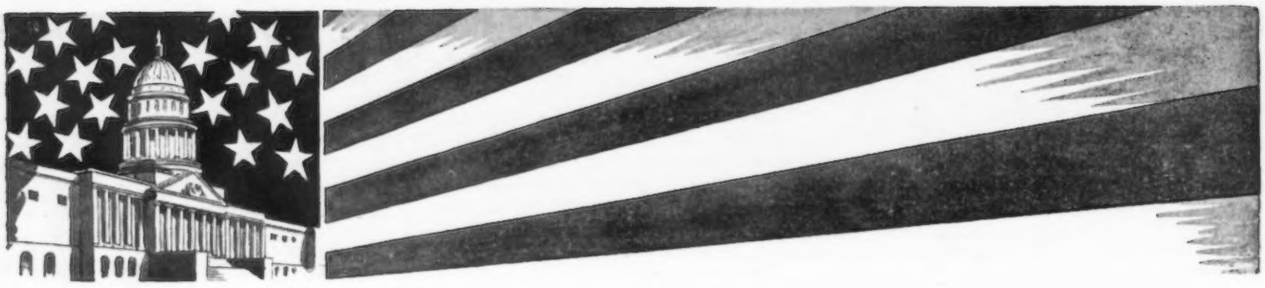
JAMES BAIRD, Portage, Wis., pioneer foundry and machine shop owner, died Feb. 1, aged 87 years. He was one of the founders of the Baird-Slinger Foundry & Machine Co., Portage, but retired about 10 years ago.

Changes in Cost of Living in January

AFTER declining for two successive months, the cost of living of wage-earners turned upward again in January, increasing 0.3 per cent over December, according to the regular monthly survey of the National Industrial Conference Board, announced today. Living costs were 5.2 per cent higher than in January, 1933, but 22.4 per cent lower than in January, 1929.

The purchasing value of the wage-earner's dollar, compared with the base 1923=100, was 129.0c. in January, 1934, as against 129.4c. in December and 139.9c. last April.



THIS WEEK IN WASHINGTON

Code Prices, Hours, Wages to Be Reviewed at General Meeting

By L. W. MOFFETT
Resident Washington Editor, THE IRON AGE

WASHINGTON, Feb. 13.—A definite policy on price provisions in codes will be laid before the general meeting on March 5 of some 275 to 300 code authorities in Washington on March 5. This gathering will represent all industries whose codes have been approved and in addition to dealing with the question of price fixing many other subjects will be taken up with the prospect that there may be considerable readjustment of many codes. Among them will be the highly important matter of hours of work and rates of pay.

General Hugh S. Johnson, National Recovery Administrator, in speaking of price provisions, has pointed out that there is a lot of misinformation on the subject. For this reason the NRA recently adopted a policy of suspending for 60 days price provisions in pending codes, unless prices were filed to become effective at once. The suspension period will permit the NRA to complete its study on the subject, a fact which is clear from the statement of General Johnson that its plans will be in shape in time to present to the general code authority conference. It is also expected that the NRA policy on hours of work and possibly of rates of pay will likewise be submitted. General Johnson has not formulated definitely his idea of the work week, but has indicated he favors 32-hr. week generally, though there would be exceptions. On rates of pay there is no indication of what the Administration has in mind. Theoretically, the 32-hr. week would increase employment by 2,500,000.

"We have a lot of experience, perhaps not enough, with a variety of the code provisions, which I invited deliberately," said General Johnson, "and we are beginning to make up our minds about what should and should not be included in the codes. They won't cover all the troubles because they constantly crop up, but it will be helpful."

Shorter Hours Will Be Proposed

The General stated that he will have developed his idea as to the shorter hours before the general code authority meeting. He said he is still of the opinion that the work-week should be based on the multiple of eight, with the 8-hr. day, and that that system is preferred by labor. As an example, he said labor would rather have a work week of four days at 8-hr. per day than a 5-day week with 6-hr. or a 6-day week with the 5-hr. day. Labor, he said wants the whole days. Moreover, the general pointed out, industry is geared to an 8-hr. day and the plan gives days and not hours off to people who profit by the shorter week. The general indicated that one objection to the plan might be that men working in one occupation for the shorter period might also take up other work, a fact which would defeat the purpose of engaging more employment.

He stated that if employment is to be increased it is necessary to shorten hours. Even going back to conditions of prosperity in 1926, General Johnson said, there probably would be 2,000,000 unemployed if the 32-hr. week were adopted.

The General said, however, that the greatest effect in shortening hours would be in the "trades," having reference to the white collar class, as distinguished from the heavy industries, where the bulk of unemployment exists. It was stated that nothing can be done about the latter. The point was not developed but apparently the thought in mind is that heavy industries generally now are at such low operations that they are unable to engage labor up to the minimum hour requirements.

Exceptions Must Be Made

The General explained that there will have to be exceptions to the 32-hr. plan. Much more could be done to aid employment and industry, he stated, if credit facilities were available. He explained that some lines have eaten up their reserves and that when they are asked to increase their costs, they find they have no means to finance their payrolls even. It was added that "You can throw a man into bankruptcy very easily."

The problem of credits, he stated, is being worked on by an NRA committee which has reported to General Johnson. The plan has not been completely worked out, it was stated, but it is understood it would call for operations through the Federal Reserve Board. The NRA committee is headed by Divisional Administrator A. D. Whiteside.

It was pointed out to General Johnson that there had been a complaint made at a code hearing that the government was arranging to finance thousands of inventories and that once these were built up employers would retain only maintenance groups. General Johnson said there is a respectable body of opinion and that a great deal can be done to

equalize employment throughout the year by requiring people to limit their inventories and not manufacture in advance of their actual orders.

The General pointed to the automobile manufacturing industry, which, he said, does not pile up much inventory. Formerly, he said, the industry did accumulate inventories by means of what was called financing winter production, running three or four months ahead on manufacturing. Business therefore, he said, was less distinctly seasonal than it is now.

The General said there are all kinds of schemes to prevent this development. One scheme, he said, is to require a reserve against seasonal employment with the idea that the less marked seasonal peaks are the less tax there is to pay. These and other plans are being considered, it was stated by the NRA which has three investigations under way. Unemployment insurance is one subject being investigated. In the opinion of General Johnson the only feasible unemployment insurance is to guard against seasonal lay-offs, and this plan, it was pointed out, has distinct limitations.

Wagner's Unemployment Reserve Proposal

A specific plan for unemployment reserve legislation is carried in a bill introduced last week by Senator Robert F. Wagner of New York. It would give the Federal Government authority to impose excise taxes upon business institutions in order to have each State pass unemployment reserve laws. These laws would be based upon Federal provisions.

The Wagner bill proposes an excise tax upon all business concerns having 10 or more employees. The tax would be equivalent to 5 per cent of the total wages paid to employees receiving less than $250 a month. Sums set aside as unemployment reserves in accordance with State laws would be allowed to offset taxes. So far Wisconsin is the only State having such an unemployment reserve act, which becomes effective July 1, 1934. In the absence of such a law employers would pay the tax, though payments would not be made in the event of unemployment to employees.

Steel & Tubes Takes Bids On Plant Extension

STEEL & Tubes, Inc., Cleveland, has asked for bids for an 80 x 400-ft. plant extension to provide additional facilities for the manufacture of electric welded boiler tubes. Electric welding and other manufacturing equipment, as well as overhead cranes, will be required. Final decision to go ahead with the project awaits submission of bids.

"Employee Representation" Faces Showdown in Steel Industry

WASHINGTON, Feb. 13.—Refusal of the Weirton Steel Co. to submit its payroll list to the National Labor Board has been met with the statement by Senator Robert F. Wagner, chairman of the Board, that it will proceed to determine if a substantial number of employees of the company desire a new election for the purpose of collective bargaining. The development brought nearer what definitely promises to be the first major test of the authority of the Board under Section 7-a of the Recovery act, covering collective bargaining. In reality it will be a test between the Board and the entire steel industry. For the American Iron and Steel Institute has taken up the cudgels in behalf of the Weirton Co. In challenging President Roosevelt's executive order, made immediately after he was called upon by a delegation from the Amalgamated Association of Iron, Steel and Tin Workers from the Weirton company, the Institute said "It intends in every practical and lawful way to resist all attacks upon such (employees' representation) plans."

The action of the Labor Board in seeking to determine if another election is desired by workers is considered by the industry to be an attack upon such plans. For the Weirton Steel Co. maintains that the recent election it held, resulting in favor of the company union, was entirely within the law as expounded by Section 7-a. Moreover, it holds that to have another election would be a breach of trust with the employees as reflected in the election already held.

The Weirton company refused to give General Counsel Milton Handler of the Labor Board its payroll list at a conference held last Friday in Pittsburgh with Chairman E. T. Weir and Counsel Earl F. Reed of the company. A reply was given Mr. Handler in the shape of a letter, which concluded, "We must decline to furnish you with any payrolls and will not permit company property to be used for the purpose of holding an election."

Wagner Is Going Ahead

Declaring that "The National Board is going right head with the first step directed by the President's executive order" to ascertain if a substantial number of Weirton employees desire an election, the Senator said the Board would check up on information already in its hands. Part of this information, he made it known, consists of a petition which the Amalgamated Association group presented to President Roosevelt at its recent call at the White House. The petition, which contains 4600 names, according to Senator Wagner, was given to Mr. Handler for the purpose of bringing it to Washington.

The manner of determining whether a substantial number of workers desire an election was left to the Board by the President's order.

In the course of his statement on the refusal of the company to turn its payroll over to the Board, Senator Wagner said:

"The National Labor Board has but one concern since the Weirton case came before the Board late in September. Mr. Weir then had a large strike on his hands. The Board obtained settlement of this strike on the basis that there should be an election. Mr. Weir signed that agreement, but when the time came for the election in December he refused to permit the Board to supervise, and he conducted a so-called election of his own. Since the beginning the Board's only concern has been that any election should be a fair, secret and untrammelled expression of the workers' desire as specified in Section 7-a of the Recovery law.

"The Board has no concern with 'imposing' any form of organization, either company union or other union. The law's intent is that no employer, Mr. Weir included, shall 'impose' on the men any specific organization. Choosing their form of organization is solely the workers' business and that the workers may transact that business without interference is what the Board is endeavoring to safeguard under the President's order."

Mr. Weir has sharply disagreed with Senator Wagner regarding the agreement made with the Board. Mr. Weir maintains that the agreement as originally prepared and signed by him provided for supervision by the Board of an election called by the company, an election which it is maintained was conducted within the terms of the agreement so far as the company is concerned.

Steel Industry Will Support Weir

The next step apparently is for the Board to ascertain in whatever manner it chooses if a substantial number of employees of the company desire a new election. It has been indicated this may be done by a poll not on company property. The company, refusing to recognize such an election, apparently would be in a position with the support of the Institute to ask for an injunction against imposing representatives of such election upon the company for purposes of collective bargaining. The Board on its part, according to a statement issued by the NRA in explaining the Executive order, has two means of

enforcing results of elections which the Board supervises. The first, it was declared, is to turn the case over to either the State or National Compliance Boards under the charge of violation of the steel code. The alternative action, it was stated, in case of evasion or non-compliance with the election results is to refer the case to the Department of Justice "for possible prosecution."

Hearing Held on Basic Machinery Industry Code

WASHINGTON, Feb. 13.—Hearing was held last Friday on the proposed basic code for the machinery and allied products industry before Deputy Administrator H. O. King. The code was presented by John W. O'Leary, president of the Machinery and Allied Products Institute and various amendments were offered by George Torrence, president of the Link Belt Co., Chicago, chairman of the code committee of the Institute.

The amended code provides a maximum of 40-hr. per week and an 8-hr. day, with overtime permitted only under exceptional conditions and then at one and one-half the normal wage rate. Minimum hourly wage rates are 36c., 38c. and 40c. in the North, based on population, and 32c. in the South for men. Women doing work different from that done by men would be paid 87½ per cent of the applicable minimum.

John A. Katz, representing the Farm Equipment Institute, W. C. Dickerman, president of the American Locomotive Works; New York, chairman of the diesel engine industry code, and T. P. Chandler of the Lubrair Corpn., Cambridge, Mass., presented briefs on the proposed definitions of the 39 subdivisions of the industry.

Application of labor provisions of the construction code to installation and erection of machinery, even though the purchase price of the equipment includes such operations, was asked by J. M. Follin, secretary of the code committee of the Construction League and by C. S. Embry of the Associated General Contractors. Mr. Embry attacked the practice in some branches of the machinery industry of bidding on entire construction projects.

Believing that regulation of production and installation of repair parts for machinery is necessary the industry has incorporated in the code a proposal that each subdivision include repair business.

Mr. Chandler objected to the administrative proposal that voting shall be on the basis of dollar sales rather than the number of employees, as originally provided. Mr. Chandler contended the provision would promote monopoly.

British Pig Iron Prices Advance But Steel Orders Lag

LONDON, ENGLAND, Feb. 13 (*By Cable*).—Home prices for British pig iron have nearly all been raised five shillings per ton. Producers are finding it difficult to meet the demand for iron and three additional Cleveland furnaces are to be started.

Steel mills report a lull in fresh business although conditions are generally active. Clyde bookings for January amounted to the best monthly total for some years. Apart from any new warship contracts, British steel mills expect to benefit from the decision to complete the unfinished giant Cunarder upon which work has been held up for some time.

Sir John Field, chairman of Guest, Keen, Baldwins Iron & Steel Co., asserts that the delay of the Government in defining its attitude toward the continuance of import duties is holding up the execution of steel production amounting to two million pounds Sterling.

Tin plate prices are steadier, owing to larger bookings and there is also a fair volume of inquiry. Tin plate mills are operating at 55 per cent.

Continental steel works are reported to be booking more business direct, though merchants complain of dull trade. The German producers state that they have no intention of leaving the Continental steel cartel at present, in spite of the rupture in the Franco-German trade agreement. Formation of a Continental thin sheet cartel is said to be imminent. Merchants are profiting at present through the fact that cartel prices vary in different markets, affording opportunity for speculation.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9				
Billets, open-hrth.	£5	10s.	to	£5	12s. 6d.
Tin plate, per base box		16s. 3d.	to		16s. 9d.
Steel bars, open-hearth	£7	17½s.	to	£8	7½s.
Beams, open-hrth.	£7	7½s.	to	£7	17½s.
Channels, open-hearth	£7	12½s.	to	£8	2½s.
Angles, open-hearth	£7	7½s.	to	£7	17½s.
Black sheets, No. 24 gage	£9	5s.			
Galvanized sheets, No. 24 gage	£11	5s.	to	£11	15s.

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.

*Ingots	£2	5s.	
*Billets, Thomas	£2	7s.	
Wire rods, No. 5 B.W.G.	£4	10s.	
*Steel bars, merchant	£3	2s.	6d.
*Sheet bars	£2	8s.	
Plates, ¼ in. and up	£4	1s.	6d.
*Plates, 3/16 in. and 5 mm.	£4	3s.	6d.
*Sheets, ⅛ in.	£4	8s.	6d.
*Ship plates	£4	10s.	
*Beams, Thomas	£2	19s.	
*Angles (basic)	£3	2s.	6d.
Hoops and strip steel over 6-in. base	£3	17s.	6d.
Wire, plain, No. 8	£5	7s.	6d.
Wire nails	£5	15s.	
Wire, barbed, 4-pt. No. 10 B.W.G.	£8	15s.	

*Prices as established by European Raw Steel Cartel.

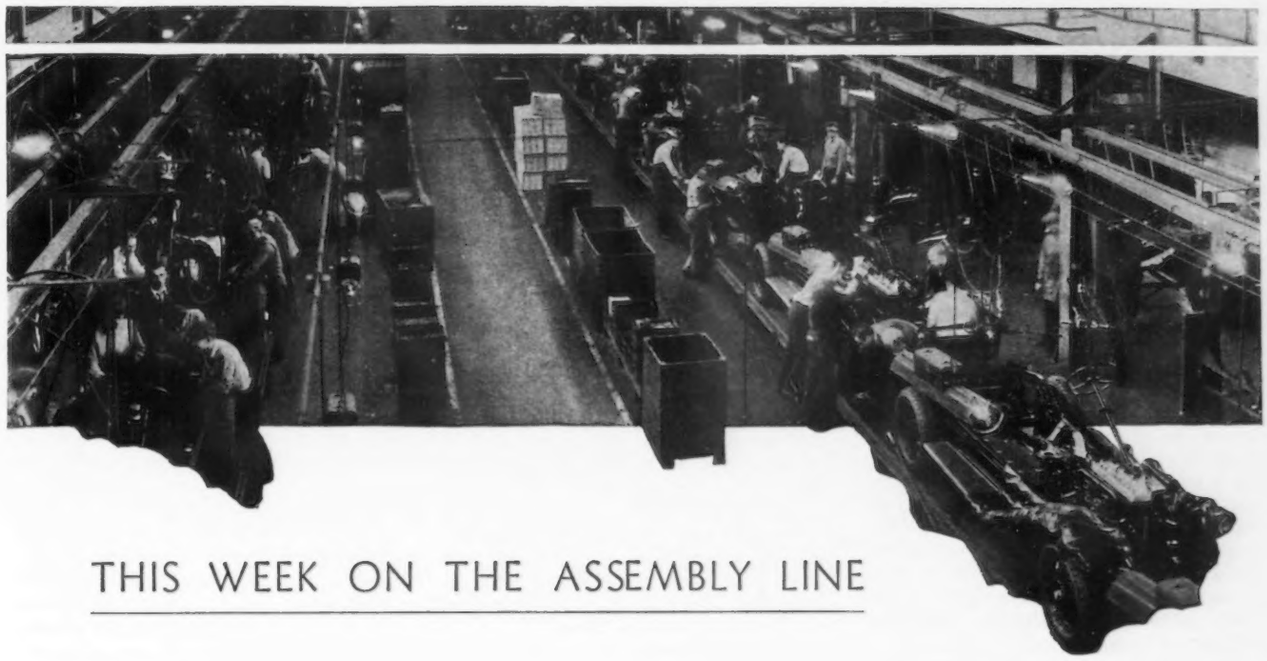
Vanadium Co. Ordered To Give Up Colonial Co.

WASHINGTON, Feb. 13.—Following an announcement it made on Jan. 15 that it would take such action, the Federal Trade Commission last week issued a formal order directing the Vanadium-Alloys Steel Co., Latrobe, Pa., to relinquish the capital stock of the Colonial Steel Co. The Commission charges the Alloys-Steel Co. with acquiring the Colonial stock in violation of Sec. 7 of the Clayton act prohibiting acquisition of stock in another corporation where the result "is to substantially lessen competition." Both companies manufacture tool steel. The Vanadium company, the Commission announced, is given six months in which to complete the divestment. It is provided the stock is not to be transferred to any stockholders, directors, employee or agent of the Vanadium company or to an affiliated company or its officers or agents.

$11,900,000 Loan for Phila.-Camden Shuttle

WASHINGTON, Feb. 13.—Administrator Harold L. Ickes last Friday announced he had signed a contract for a PWA loan of $11,900,000 to the Delaware River Joint Commission for constructing and equipping a rapid transit shuttle line across the Delaware River Bridge between Philadelphia and Camden. Some of the steel for approaches to the bridge has been awarded, 1540 tons for the subway approach having gone to the McClintic-Marshall Corpn.

The project comprises construction of a high-speed rapid transit shuttle line together with the necessary approaches on both sides and terminal facilities and 26 passenger cars.



THIS WEEK ON THE ASSEMBLY LINE

February Output To Be 270,000 Units

DETROIT, FEB. 13.

MOTOR car production continued to climb the past week toward heights not attained for several years. The increase was so great that February output now is estimated at 270,000 units, compared with 110,123 in 1933, 122,895 in 1932 and 229,811 in 1931. One must go back to 1930, before the country began to feel the ravages of depression, to find a larger volume in the second month of the year.

Much the same situation will exist in March. Assemblies easily should run 325,000 units, with 350,000 a possibility. Last year the March output was 124,581 cars and trucks, in 1932 it was 127,277 and in 1931 289,398. One of the leading low-price car manufacturers privately says that if it could supply the demand, today it could book orders from its dealers for over half a million cars. It has been a long time since the automobile retail trade has been so permeated with confidence.

Since tentative schedules for April call for expansion beyond the March program, it is entirely within the bounds of probability that the initial month of the second quarter will be the first 400,000-car month since May, 1930. Some steel men are apprehensive lest heavy buying of flat-rolled steel may be mostly in anticipation of a price advance, thereby slowing down mill operations next quarter. There is little or nothing in the current situation to support such fears.

Steel Needed for Immediate Production

Almost all steel buying at the moment is inspired by the need of the material for fabrication at a relatively early date. For automobile plants to be caught short of steel at a time when they are running at a three-year peak would be little short of disastrous and would disrupt their whole program. Hence the scramble to lay down steel tonnage at motor car factories as rapidly as possible. In some cases users have posted representatives at steel plants to see that they get their share of the materials coming off the mills. With the automobile industry now operating at a rate close to 300,000 units a month, and with each car averaging at least one ton of steel, it should be remembered that the stocks of steel in the hands of Detroit consumers are rapidly diminishing.

One prominent maker of flat-rolled steel, whose mills now are not far from capacity production, expects the current pace to be sustained not only through the remainder of the first quarter, but also through most if not all of the second quarter. This is not the outlook of an isolated Pollyanna, but is the consensus of opinion in well-informed circles. The only uncertain factor, which might make all predictions go awry, is the labor situation. It is still acute and will remain so, although a strike is not probable.

Chevrolet Making 3500 Cars a Day

Chevrolet increased its output the past week to a total of about 20,000 units. Its daily assemblies are approximately 3500 cars and trucks. The February total should be 70,000 to 75,000 units. March will top the 100,000 mark, unless manufacturing difficulties are not overcome as quickly as anticipated. April may go as high as 125,000. It is no secret that Chevrolet is shooting at a goal of 6000 units a day, but will not be able to hit it before April. The reason is that full production cannot be obtained until the large amount of new equipment, for which orders have been placed the past two weeks, is installed. This machinery cannot begin to function until at least April 1.

It is reported that Chevrolet's expenditures for new equipment have amounted to $3,500,000, of which about $1,500,000 was for machine tools. As a part of Chevrolet's local new deal, the gear and axle plant has a new general manager, S. A. Woodmancy, formerly manager of the transmission plant at Toledo.

Some of the screw machine products and light stampings made at the Chevrolet gear and axle plant will be manufactured hereafter at the Bay City, Mich., plant. The first announcement that some parts made in Detroit

would be transferred to Bay City appeared in this column on Feb. 8

In view of the fact that in predepression days Chevrolet made 130,000 to 140,000 units in its local plant without overtaxing its facilities, some observers are perplexed over the inability of the plant today to get near its former capacity without buying a large amount of new equipment. The truth is that new production processes, especially the operations connected with knee-action wheels, have cut down the plant's capacity about 25 per cent.

Representatives of A. O. Smith Corpn. and the Kelsey-Hayes Wheel Corpn. are said to have been called in on the matter of making the steel housing inclosing Chevrolet's coil springs. It will be recalled that the weld on this housing is 36 in. long, and the perfection of the welding process was the hardest production trick to master. The story is that both A. O. Smith and Kelsey-Hayes may fabricate a portion of the housings.

Pontiac and Buick's operations have been gaining. Olds Motor Works and Cadillac-LaSalle are the two General Motors divisions which are the slowest getting started. Oldsmobile will not reach relatively good production until March. It will have to step along at a fast clip if it expects to secure its anticipated 100,000 cars this year.

Plymouth Assembling 1000 to 1500 a Day

Plymouth assemblies vary daily from 1000 to 1500 cars. Dodge is turning out 500 a day and is understood to be considering expansion of its manufacturing facilities to take care of the expected 1934 demand. De Soto and Chrysler Airflow cars are now in regular production, although the daily rate is very small. The equipment bought last week for the Jefferson Avenue plant will be used to make front-end units for the Chrysler six.

Ford has further increased operations at the Rouge plant, with February output still estimated at 75,000 units. Its projected schedule for next month calls for an increase over this month, while April is expected to bring a rise to the 100,000 point.

The National Automobile Chamber of Commerce puts the January total for the United States and Canada at 155,000 units. General Motors contributed 62,506 units, or 40 per cent; Ford 57,000 units, or 36 per cent; and Chrysler 28,504 units, or 18 per cent.

Hudson-Terraplane has put into operation a third production line and is preparing a fourth. It expects to make 14,000 cars in February and 18,000 in March. Reo, which apparently is going through the process of rejuvenation, is planning on a scale not contemplated in years and is ordering materials, including steel, on that basis. Its new Flying Cloud will be introduced about April 1.

Packard continues to make approximately 100 cars a day. Hupmobile is in the midst of a fight between majority and minority stockholders over control of the company. Graham-Paige already is exceeding its early manufacturing expectations.

Heavy production demands are forcing motor car makers to farm out work which they have been doing exclusively in their own plants. Chevrolet perhaps is the most conspicuous example. Murray Corpn. is finding itself unable to take care of all of its requirements in its own departments and has given stamping contracts to outside companies.

Spanish Motor Car Maker Places Parts Order

Largely on account of the favorable exchange situation, interest of foreign automobile companies in purchasing tools and automotive parts in the United States continues keen. The production manager of Andre Citroen is back in this country for a short stay, apparently to clean up the large tooling program launched several months ago. Fresh buying on this visit, however, will be negligible.

The Hispano Motor Co. has placed an order for $100,000 worth of automobile parts with the Clark Equipment Co., Buchanan, Mich. Shipments are to be made to the company's plant at Barcelona, Spain. Motor car companies in the Balkan States are to send representatives to this country to buy equipment for a new tooling program. Their headquarters will be in Detroit.

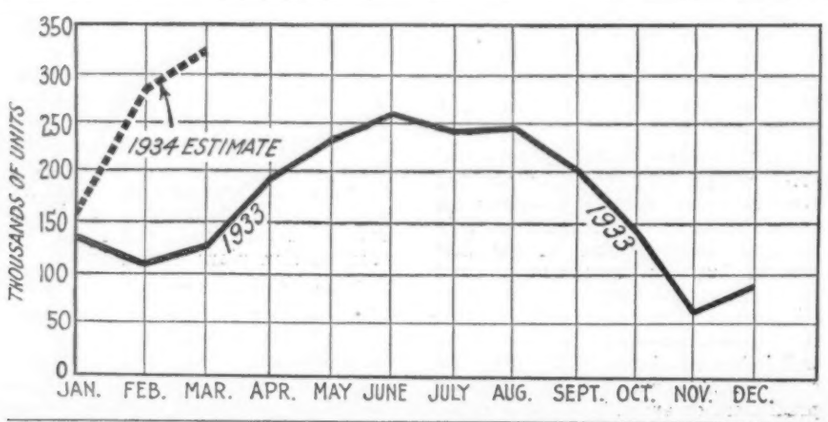
Steel releases are widening, with bookings of forging steel increasing, but the chief demand still is concentrated in flat-rolled products. Great Lakes Steel Corpn. is operating all eight of its open-hearth furnaces, and its sheet and strip mills are running at capacity. Newton's mills at Monroe are at full capacity.

The Corrigan - McKinney - General Motors deal seems to be definitely off. Chills no longer surge up the backs of steel men as they talk about this matter.

The question of delivered prices, tossed into the automotive ring by Chevrolet, is being discussed by members of the N.A.C.C., and an agreement upon a modified form of quoting delivered prices is anticipated shortly.

Tentative production schedules for March show that four manufacturers will turn out 325,000 cars. General Motors has 145,000 units projected, Ford 85,000, Chrysler 77,000 and Hudson 18,000. The General Motors estimate is broken down as follows: Chevrolet 100,000 units, Pontiac 18,000, Buick 10,000, Oldsmobile 13,500, Cadillac 3500. In February the same four companies, General Motors, Ford, Chrysler and Hudson, are expected to assemble 245,000 units. Ford of Canada made 4239 cars and trucks in January and has 4365 units as its February goal. The Graham Paige total this month should be 2000 cars. Cadillac is assembling about 400 of its V-8 cars a week and this week will be in production of its V-12 and 16. Before the end of the month the manufacture of the new LaSalle will get under way.

M. A. Coyle, general manager of the Chevrolet Motor Co., states that the automobile industry is second only to the printing industry in the amount of wages paid to labor. The average wage now being paid by Chevrolet is slightly under 70c. an hr.



Automobile Production—United States and Canada

	January	February	March
1934.....	155,000*	270,000*	325,000*
1933.....	133,402	110,123	124,581
1932.....	123,075	122,895	127,277
1931.....	178,344	229,811	289,398
1930.....	283,610	345,961	417,118

*Estimated.

Accumulating Demands Lift Steel Output To 41 Per Cent

Large Tin Plate Release, Heavy Automotive Specifications and Rise in Miscellaneous Orders Are Features—Scrap Higher at Pittsburgh

HEAVY specifications for tin plate from the leading manufacturer of containers have supplemented large releases of steel from the automobile industry in adding to the momentum of current demand, and steel ingot production has risen three points to 41 per cent of capacity.

The accumulating pressure for steel has been reflected in an upward turn in the Pittsburgh scrap market, which had recently been reactionary, and has been accompanied by growing foundry consumption of pig iron. An advance of 50c. a ton in heavy melting steel at Pittsburgh has raised THE IRON AGE scrap composite from $11.92 to $12.08 a ton, putting it above the previous high for this year of $12 and bringing it close to the high of $12.25 for 1933, reached last August. Pig iron shipments from Central Western centers are now running 35 per cent ahead of those of January, indicating that inventories accumulated in December are being liquidated and that melt is gaining in keeping with the expanding needs of the automobile industry and miscellaneous consumers.

WITH automobile production rapidly getting back to 1930 levels, manufacturers are increasingly aware of the danger of running short of materials. In some cases they have posted representatives at steel plants to see that they get their share of the tonnage coming off mills.

February output of motor cars is now estimated at 270,000 units, compared with 110,123 in 1933, 122,895 in 1932 and 229,811 in 1931. March assemblies are expected to total close to 350,000, compared with 124,581 a year ago, 127,277 in 1932 and 289,398 in 1931.

In view of the pace of current operations and their steady trend upward, stocks of steel in the hands of motor car builders are rapidly diminishing. Originally regarded as a protection against price advances, the stock accumulations of the automobile industry are really proving to be a much needed cushion at a time when gains in production are exceeding expectations. Similarly the piling of stocks of raw and semi-finished steel by mills last month is turning out to be an aid in speeding up operations. While the decline in the Steel Corporation's shipments from 600,639 tons in December to 331,777 tons in January indicates considerable piling of material, the production rate considered, it is now apparent that this steel will not be idle long. Sheet and strip mill operations for the country have risen to 55 per cent, and tin plate production has jumped from 40 to 60 per cent of capacity.

THIS growing activity will soon be augmented by tonnage from the railroads. Public Works Administrator Ickes has sent a check of $425,000 to the New Haven, representing the first instalment on that railroad's loan of $3,500,000 from the PWA for car repairs. Work will commence immediately and $300,000 out of the initial instalment will be expended for materials. The Pennsylvania has drawn its first instalment of $6,990,000 on a $77,000,000 PWA loan for freight car construction and electrification work. Orders for some 80,000 tons of steel for the cars will be distributed this week. Only the approval of the Interstate Commerce Commission is necessary to release to mills 100,000 tons of rails, which were informally awarded by the Pennsylvania in December.

The Van Sweringen car orders, calling for 175,000 tons of steel, have not yet been formally awarded and the steel will not reach the mills until March. Formal signing of contracts for 500 freight cars placed by the Lehigh & New England is also still to be accomplished.

Public construction work, long counted on as a main support of steel mill activity, is still disappointingly small in terms of tonnage. Structural steel lettings, at 11,650 tons, compare with 9850 tons in the previous week. New projects, however, total 22,945 tons.

THE pressure of current steel demand has been heaviest in the case of mills rolling wide and highly finished sheets. These producers, in some cases, have asked that all first quarter specifications be filed so that they can determine whether any additional tonnage in current orders can be accepted for shipment before March 31. Reports regarding possible price advances for second quarter are conflicting, apparently reflecting a sharp division of opinion. Possibly the best guess is that price increases are fairly sure on those finishes of sheets on which costs have risen most, with advances on other products still highly uncertain.

Ingot output has risen five points to 25 per cent at Pittsburgh, two points to 38 per cent at Chicago, three points to 45 per cent in the Valleys, two points to 26 per cent in the Philadelphia district, five points to 63 per cent at Cleveland, five points to 43 per cent at Buffalo, and 15 points to 75 per cent in the Wheeling district. The South alone has shown a decline, from 50 to 46 per cent of capacity.

THE IRON AGE composite prices for pig iron and finished steel are unchanged at $16.90 a ton and 2.028c. a lb. respectively.

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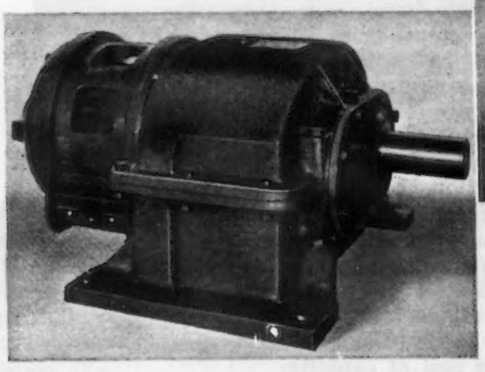

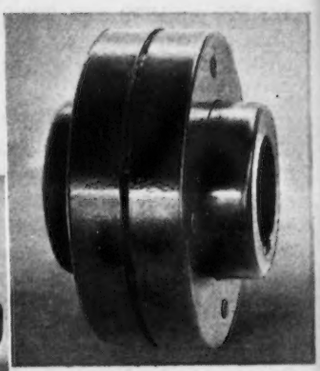

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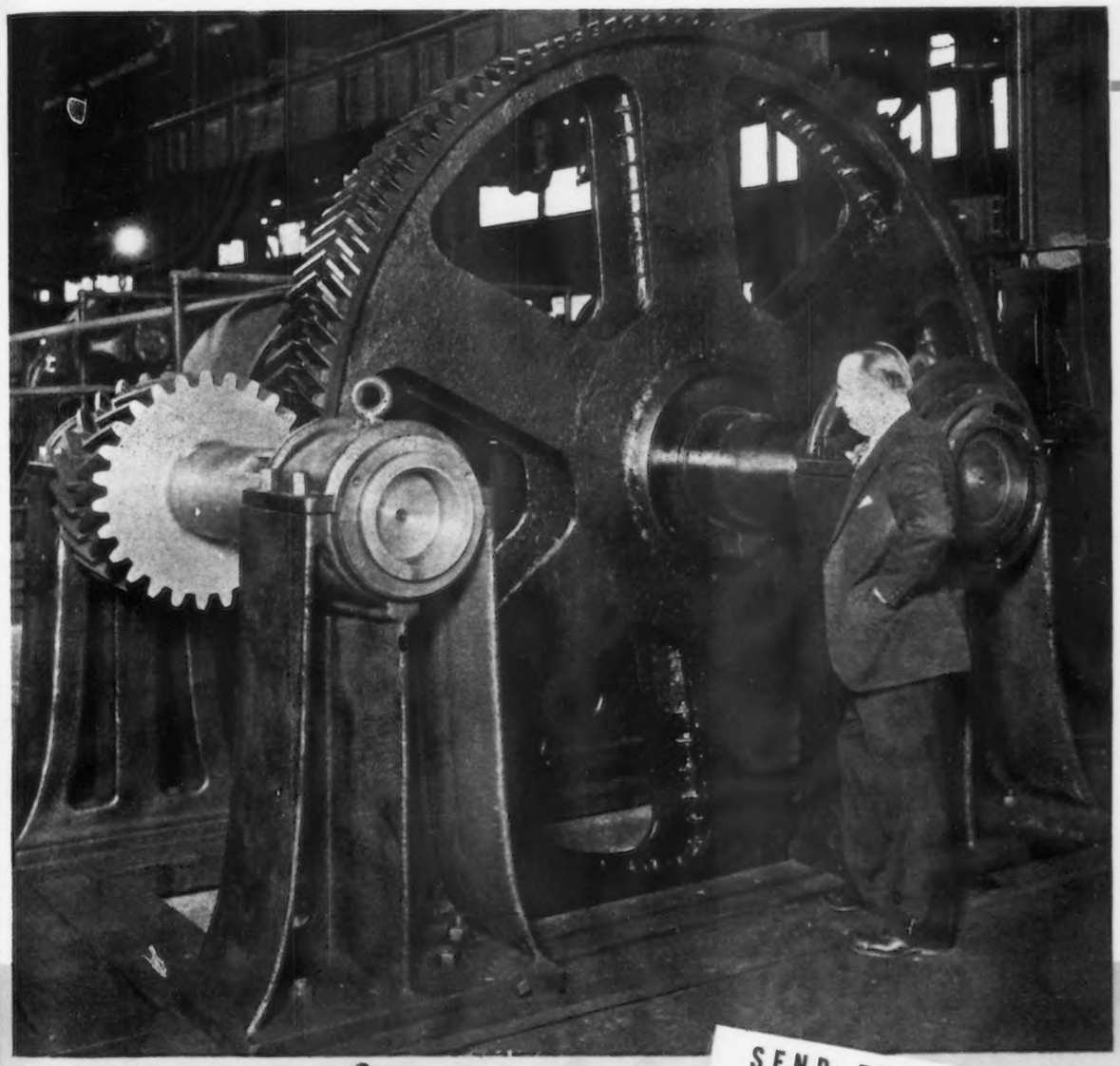

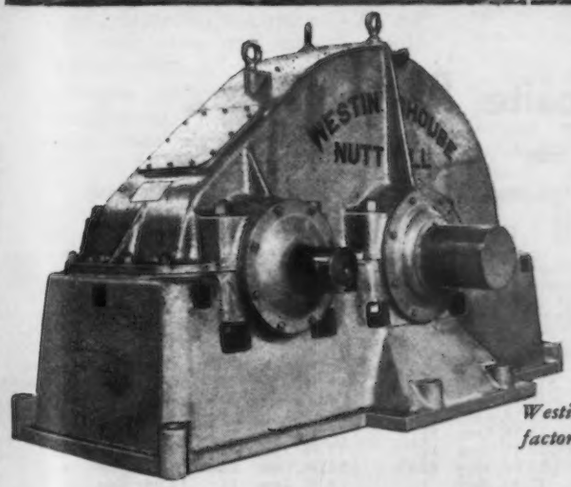

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▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Feb. 13, 1934	Feb. 6, 1934	Jan. 16, 1934	Feb. 14, 1933
Per Gross Ton:				
No. 2 fdy., Philadelphia	$19.26	$19.26	$19.26	$13.34
No. 2, Valley furnace	17.50	17.50	17.50	14.50
No. 2 Southern, Cin'ti	18.13	18.13	18.13	13.82
No. 2, Birmingham†	13.50	13.50	13.50	11.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	15.50
Basic, del'd eastern Pa.	18.76	18.76	18.76	13.50
Basic, Valley furnace	17.00	17.00	17.00	13.50
Valley Bessemer, del'd P'gh	19.76	19.76	19.76	16.89
Malleable, Chicago*	17.50	17.50	17.50	15.50
Malleable, Valley	17.50	17.50	17.50	14.50
L. S. charcoal, Chicago	23.54	23.54	23.54	23.17
Ferromanganese, seab'd carlots	85.00	85.00	85.00	68.00

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$40.00
Light rails, Pittsburgh	32.00	32.00	32.00	30.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	26.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	26.00
Slabs, Pittsburgh	26.00	26.00	26.00	26.00
Forging billets, Pittsburgh	31.00	31.00	31.00	31.00
Wire rods, Pittsburgh	36.00	36.00	36.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

	Cents	Cents	Cents	Cents
Per Lb.:				
Bars, Pittsburgh	1.75	1.75	1.75	1.60
Bars, Chicago	1.80	1.80	1.80	1.70
Bars, Cleveland	1.80	1.80	1.80	1.65
Bars, New York	2.08	2.08	2.08	1.95
Plates, Pittsburgh	1.70	1.70	1.70	1.60
Plates, Chicago	1.75	1.75	1.75	1.70
Plates, New York	1.98	1.98	1.98	1.698
Structural shapes, Pittsburgh	1.70	1.70	1.70	1.60
Structural shapes, Chicago	1.75	1.75	1.75	1.70
Structural shapes, New York	1.95¼	1.95¼	1.95¼	1.86775
Cold-finished bars, P'gh	2.10	2.10	2.10	1.70
Hot-rolled strips, P'gh	1.75	1.75	1.75	1.45
Cold-rolled strips, P'gh	2.40	2.40	2.40	1.80

Finished Steel

	Feb. 13, 1934	Feb. 6, 1934	Jan. 16, 1934	Feb. 14, 1933
Per Lb.:	Cents	Cents	Cents	Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.25	2.25	2.25	2.00
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.35	2.35	2.35	2.00
Sheets, galv., No. 24, P'gh	2.85	2.85	2.85	2.50
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.95	2.60
Hot-rolled sheets, No. 10, P'gh	1.75	1.75	1.75	1.45
Hot-rolled sheets, No. 10, Chicago dist. mill	1.85	1.85	1.85	1.55
Wire nails, Pittsburgh	2.35	2.35	2.35	1.80
Wire nails, Chicago dist. mill	2.40	2.40	2.40	1.85
Plain wire, Pittsburgh	2.20	2.20	2.20	2.10
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.15
Barbed wire, galv., P'gh	2.85	2.85	2.85	2.30
Barbed wire, galv., Chicago dist mill	2.90	2.90	2.90	2.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$4.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$13.75	$13.25	$13.25	$8.50
Heavy melting steel, Phila.	11.75	11.75	11.75	6.75
Heavy melting steel, Ch'go	10.75	10.75	10.50	5.25
Carwheels, Chicago	11.25	11.00	11.00	8.00
Carwheels, Philadelphia	12.75	12.75	11.75	8.00
No. 1 cast, Pittsburgh	12.25	12.25	11.75	9.00
No. 1 cast, Philadelphia	12.50	12.50	12.50	8.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	9.50	6.25
No. 1 RR. wrot., Phila	11.00	11.00	11.00	7.50
No. 1 RR. wrot., Ch'go (net)	9.25	9.25	9.00	4.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.50	$3.50	$3.50	$1.75
Foundry coke, prompt	4.25	4.25	4.25	2.50

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery	7.75	7.75	7.75	4.75
Lake copper, New York	8.00	8.00	8.00	5.00
Tin (Straits), New York	51.05	51.25	52.37½	23.60
Zinc, East St. Louis	4.40	4.40	4.25	2.65
Zinc, New York	4.75	4.75	4.60	3.02
Lead, St. Louis	3.90	3.90	3.90	2.87½
Lead, New York	4.00	4.00	4.00	3.00
Antimony (Asiatic), N. Y.	7.15	7.15	7.20	5.75

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

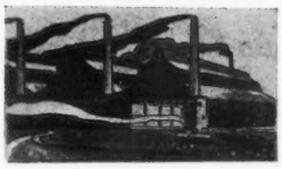
▲ ▲ ▲

▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
Feb. 13, 1934	2.028c. a Lb.	$16.90 a Gross Ton	$12.08 a Gross Ton
One week ago	2.028c.	16.90	11.92
One month ago	2.028c.	16.90	11.83
One year ago	1.923c.	13.56	6.83
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low	High	Low	High	Low
1933	2.036c., Oct. 3	1.867c., Apr. 18	$16.90, Dec. 5	$13.56, Jan. 3	$12.25, Aug. 8	$6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.42, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Output Higher in Pittsburgh, Valley and Wheeling Districts



Large Tin Plate Releases Supplemented by Automotive Orders Push Up Mill Operations—Scrap Advances

PITTSBURGH, Feb. 13. — Continued strong demand for sheets and strip steel, sharply increased tin plate specifications, and gradual expansion in miscellaneous demand for finished steel products have finally brought momentum to the local steel market. Mill operations have increased sharply, and heavy specifications in prospect from the railroad car builders and structural steel fabricators give promise of further improvement before the end of the month.

Steel ingot production in the immediate Pittsburgh district has risen five points to 25 per cent of capacity, after having remained around a 20 per cent level for more than a fortnight. The leading interest has increased its production because of improved demand for sheet bars for both tin plate and sheet mills, while the largest independent company has also been able to boost its output. The smaller independent mills are having no difficulty maintaining recent comparatively high production levels.

Steel output in the Valleys has advanced to at least 45 per cent of capacity, with further gains in prospect before the end of the week. Wheeling district production is now estimated at 75 per cent of capacity.

Among finishing lines, tin plate schedules have shown the sharpest increase, having jumped from 40 to 60 per cent of capacity. This improvement is largely traceable to the placing of heavy specifications by the leading manufacturer of containers. Sheet production has risen to 55 per cent, with strip mill schedules only slightly lower.

Despite the large apparent gains in steel demand, the automotive and container manufacturing industries are the only outstanding steel consumers which are actually placing heavy orders. Freight car tonnage has not yet reached mills, structural steel and reinforcing bar demand is still prospective rather than actual. Pittsburgh makers of wire products have experienced no improvement in the requirements of the agricultural industry, and demand from the oil companies is unchanged. Pig iron demand has been given slight impetus by makers of railroad castings, and the scrap market has strengthened considerably.

Pig Iron

Demand for pig iron is unchanged, although several users in this district are planning to increase operations as a result of orders for railroad castings. Steel-making iron is very quiet, with large users showing no interest in making purchases.

Semi-Finished Steel

The prospect of an advance in billet, slab and sheet bar prices has been clouded by the reduction in hot-rolled strip quotations at Chicago. Buyers of semi-finished steel would take violent exception to any advance in raw steel prices which was not accompanied by a corresponding increase in the price of their finished products. Under the circumstances, if sheet and strip quotations are not raised, semi-finished will probably remain at $26, Pittsburgh. Both sheet bars and billets are moving in good volume, particularly in the Valleys and adjacent territory. Forging billets are fairly active, and makers of wire rods are securing heavier tonnage from the bolt and nut makers.

Rails and Track Accessories

Although the rail market is more active in the Chicago district, carriers served by the Pittsburgh mill are showing no further disposition to make purchases. The local producer has fair-sized orders on its books, but has not had releases on a sufficient amount of this tonnage to warrant a production schedule. Specifications against old contracts for accessories are very light, and new business is lacking. Most of the carriers apparently believe that they can secure their year's requirements during the second quarter without crowding mills, and may wait until the end of March before placing additional business.

Bars

With automotive demand beginning to make itself felt in this district, buying of both merchant and alloy steel bars is showing improvement. Manufacturers' stocks which were built up in December seem to have been utilized in most instances, and buyers who had not been in the market since the first of the year are again showing interest. The requirements of cold finishing mills are heavier. The reinforcing bar market continues quiet. Sizable projects are lacking in this district, and inquiry is slow to develop.

Cold-Finished Steel Bars

With demand from the automotive industry gradually expanding, this market is becoming more active. February tonnage shows a considerable improvement over the corresponding January period, with the prospect of increased gains later in the month.

Warehouse Business

Warehouse prices on merchant wire products have been revised, with local distributers now quoting delivered quotations for shipments to consumers in the Pittsburgh switching district, in addition to f.o.b. figures for movement into outside territory. Wire nails are quoted at 2.45c., f.o.b. warehouse, with 2.557c. delivered in the Pittsburgh switching district. Prices on cold-finished steel bars have been similarly adjusted. No other changes are reported, and the market continues rather quiet.

Plates and Shapes

Railroad car builders who shared in the recent orders for freight and passenger cars for the Van Sweringen group of railroads have not yet formally allocated the steel for this business. However, with the cars divided among eleven builders, steel producers in this district are expecting to get at least one-third of the 175,000 tons of plates and shapes required. The Pennsylvania has also delayed placing its freight car steel, for which bids were opened last week in Philadelphia. Some additional car business is in sight, but formal inquiry is held up pending financial negotiations in Washington. Demand for plates from other sources continues quiet. The fabricated structural steel market is gradually improving, but recent awards have not been widely distributed throughout the industry. New inquiry continues fairly active, with railroad projects becoming more of a factor. Private jobs are still very light.

Tubular Goods

Business in most lines of pipe continues quiet, with slightly increased activity reported in boiler tubes. Demand for oil country goods continues to make a fairly good showing, with standard pipe particularly dull.

Wire Products

Increasing shipments to the automotive industry are giving the market a better tone, although aggregate demand for wire products is still disappointing. Improvement in demand for merchant goods from the agricultural districts is still delayed, although sentiment in the West and South is reported to be good.

Sheets

With automotive requirements continuing to expand, the sheet industry

is still very active. Production this week is likely to reach 55 per cent of capacity, with additional mills being prepared for operation. A number of companies are sold up through the quarter on certain finishes of sheets, although this condition holds true only in the case of very wide material. Several thousand tons of sheets for car roofing are likely to be placed within the next week or two, but demand from other consuming lines shows no marked increase. No definite information regarding the intentions of producers as to price advances for the second quarter is available in this district, and opinion seems to be well divided. An expected increase in sheet bar quotations may not materialize, but if raw steel is advanced, small independent makers may be expected to file higher prices on their finished products.

Tin Plate

The placing of unusually heavy specifications by a leading consumer last week has enabled several producers to step up their schedules sharply, and the industry is now running at about 60 per cent of capacity, compared with 40 per cent last week. The leading interest is engaged at an even higher rate, and one independent is fully engaged. Most of the recent specifications are for shipment in April or later, but producers have been able to adjust mill schedules to profitable levels.

Strip Steel

The reduction in the price of hot-rolled strip at Chicago last week has affected this market only to the extent that local producers will have to meet a lower price when selling in the Chicago territory. However, market sentiment has changed materially. While an advance in prices had been widely anticipated, many sellers now believe that this would be inopportune. It is also logical to assume that if the producer that filed a lower price at Chicago had expected to increase prices in the second quarter, it would have been much simpler to file a $2 advance at Pittsburgh and a $1 advance at Chicago, if the desired result had only been a reduction in the differential between the two bases. Demand for strip steel continues active, with mills engaged at better than 50 per cent of capacity. Further heavy buying by the automotive industry is expected in the next two weeks.

Coal and Coke

The coke market shows little change, with the heavy movement of domestic grades largely over. Demand last week was almost all of an urgent character, and sellers had difficulty making deliveries. The furnace grade is very quiet, and shipments to foundries have not improved perceptibly. Coal for industrial purposes is moving in light volume.

Scrap

High prices realized on recent railroad lists and increased bidding by brokers to cover old orders have advanced the market on ordinary No. 1 heavy melting steel in this district to $13.50 to $14.00. Railroad material is easily bringing the usual 50c. premium, the recent Pennsylvania list having been sold to a dealer at $14.30. Mills are said to have offered $14 for substantial tonnages of ordinary steel, but heavy purchases in nearby districts have reduced the supply in this territory to a point at which dealers are afraid to extend themselves. Purchase of as much as 20,000 tons of No. 1 steel and hydraulic sheets by the Lorain, Ohio, consumer has not affected this market particularly, as a large part of the material sold will come from Michigan. The other grades of scrap are equally strong, and with steel ingot production rising sharply throughout the entire territory, there is every reason to believe that the scrap market will go higher. In the meantime, dealers are paying as high as $13.75 to cover old orders, even though the most recent sale was at only $13.50. The specialties on the Pennsylvania Railroad list brought $15.50, and the rails more than $14.

Large Increase in Scrap Output at Detroit

DETROIT, Feb. 13.—Scrap is coming out of automobile plants in the greatest volume since 1929, with the result that prices are holding close to last week's levels despite increasing demand from consumers. Hydraulic bundles, flashings and low phosphorus plate scrap are the only steel items which have advanced. A scarcity of cast iron grades has forced No. 1 machinery cast and automotive cast up 50c. a ton. Old material is flowing more freely from this district into other steel producing districts.

Buffalo Steel Rate Still Rising

BUFFALO, Feb. 13.—Open-hearth operations again increased over the week-end, when the Lackawanna plant of Bethlehem Steel Corpn. added two units, making ten furnaces active. Increased automobile schedules helped to accelerate production. The Seneca sheet division of Bethlehem continues at 80 per cent. Republic Steel Corpn. has five active open-hearths on and Wickwire-Spencer one.

Three highway bridge jobs in Erie, Deerfield and Bradford counties, Pa., call for 350 tons of structural steel and one larger job will take 1000 tons. Bids were due Feb. 9. A local fabricator has contracted for 165 tons of structural steel for conveyors for the Kelley Island Lime & Transport Co., Rockport, Mich.

Shipments of pig iron so far this month are better than during the corresponding period in January. Makers sense a slow, upward trend. Here and there, foundries are very busy. Selling has been in moderate tonnages, since all contracts must be cleaned up by the end of the quarter. Makers see an end, for the time being, of purchases of heavy tonnages for purposes of speculation. It is reported that one inquiry in New England, now current, is for 1000 tons of foundry.

The scrap market continues to be excited by reports of imminent higher prices. The largest consumer in the area cannot buy No. 1 heavy melting steel at its last purchase price, but so far declines to raise the figure. It is claimed that the next tonnage of No. 1 steel will not be sold at less than $11.75. No. 1 machinery cast is firm, with dealers offering $12.50 to fill orders. Dealers will also pay $9.50 for stove plate.

Canadian Exports of Steel Improve

TORONTO, Ont., Feb. 13.—Canadian mills report a better export demand for various lines of iron and steel and recently have made large shipments to Britain and Wales. Domestic demand also is on the upgrade. The automotive industry is taking larger quantities of materials and there also is a sustained demand for steel, tools and equipment from the mining industry.

Pig iron sales are holding to an average of approximately 600 tons per week. Pig iron production is holding at a steady rate of better than 35,000 tons monthly.

Trading in iron and steel scrap continues spotty with indications of fairly extensive demand for the spring, especially in sales to Britain.

Penna. R. R. Allots 100,000 Tons of Rails

WASHINGTON, Feb. 13.—The Pennsylvania Railroad will distribute 100,000 tons of steel rails among four steel companies as follows: Bethlehem Steel Co., 44,000 tons; Carnegie Steel Co., 42,000 tons; Illinois Steel Co., 8000, and Inland Steel Co., 6000.

The carrier made this known in applications filed yesterday with the Interstate Commerce Commission. One asked for commission approval of a PWA loan of $3,650,000 which has been allotted to the Pennsylvania for purchase of the rails. The other application asked authority to offer the Government ten-year 4 per cent notes as collateral for the loan.

Steel Production in Further Gain at Chicago

Ingot Rate Rises Two Points to 38 Per Cent of Capacity—Automotive and Farm Implement Orders Support Operations

CHICAGO, Feb. 13.—Steel orders are coming in more rapidly and ingot output has registered another gain, but sellers frankly admit that the market is out of balance and that activity is not what they had expected by mid-February. Ingot production now stands at 38 per cent of capacity, a gain of two points. The outlook for the lighting of additional open-hearths is favorable in view of the approach of more moderate weather, the climbing needs of automobile and farm implement manufacturers, and the prospect that railroad car tonnages will reach mills in the near future. The Union Pacific, having accepted a three-car "speed train," has placed orders with the Pullman company for three similar trains, one of which will consist of six cars and the other nine cars. Otherwise the railroad car market remains quiet, though reports of additional buying are more or less constantly in the air.

Pig Iron

Shipments of Northern foundry iron are running fully 35 per cent ahead of the January rate and specifications point to a still heavier movement as the month advances. Automobile foundries are going strong, and farm implement and machinery units show improvement. Railroad equipment foundries are preparing for better operations, and jobbing foundries report moderate gains in orders. Salesmen covering the trade last week reported back that only 3 per cent of the foundries visited complained that there had been no increase in orders.

Reinforcing Bars

Definite inquiries are rather scarce, but a considerable number of projects will soon come out for figures. Awards are the lightest in many weeks. A severe cold spell has unquestionably retarded activity, and, then too, this time of year is normally an off season for outdoor work. Two general contracts have been let at Chicago for sewers. Evanston, Ill., plans to build a heavily reinforced underground water storage tank, and two Indiana cities, Bloomington and Marion, will expand their water supply plants. Illinois continues to open bids for roads and bridges, but winter weather holds back shipments of the necessary bars.

Cast Iron Pipe

An inquiry by Cook County, Ill., for 30,000 ft. of 12-in. pipe is outstanding in a quiet market. The outlook, however, is not wholly unpromising since a number of sizable general contracts have been placed and orders for the needed pipe should soon be announced. Extremely cold weather in most of the Northern States has had its usual dampening effect on any attempts to carry on work which is under construction.

Rails and Track Supplies

Distribution of the 40,000 tons of rails recently ordered by the Southern Pacific was 14,000 tons to the Colorado mill, 8000 tons to Bethlehem and 18,000 tons to the Tennessee company. The Chicago & North Western has obtained a PWA loan for $1,400,000, out of which it will purchase 26,500 tons of rails, 1400 tons of rail joints, 4000 tons of tie plates and several thousand tons of miscellaneous track accessories. Sellers are keeping close tab on the situation for the reason that the present rail price agreement expires March 1 and deliveries made under the present price schedule must all be completed by June 30. Recent accessory orders have been liberal, the aggregate tonnage being in excess of 8000 tons. Current specifications for track supplies are slowly expanding.

Wire Products

Both new buying and specifications are slowly expanding and February figures are already ahead of those for January. Production has been stepped up to conform to the new demand, the rate now being 40 to 45 per cent of capacity. Use of nails is heavier because of public works programs and mesh is moving in fair volume for CWA projects. Demand from rural areas is spotty, but heavier in the aggregate. Improvement is noted in those areas where processing tax money has been distributed. Automobile manufacturers are starting advance buying and their specifications, as well as those from parts makers, are decidedly better. Spring manufacturers and users of cold-finished bars are taking more steel.

Bars

The primary impetus in this market comes from the growing activity of automobile manufacturers. Miscellaneous demand, including business from forge shops in the Chicago area, remains spotty and has not shown much of an increase in the new year. Shipments to automobile manufacturing centers are registering new gains and the trend is strongly upward.

Plates

The Milwaukee Road is taking prices on 30 locomotives which it contemplates buying if it obtains a PWA loan. By and large the plate market must look to railroad equipment for needed tonnage. However, several inquiries, including a coal and ore dock in Michigan and some dredges and pontoons for Missouri River work promise supplementary help to plate mill operations.

Structural Material

Awards are light at 6000 tons, but because of the Ford world's fair building, calling for 1400 tons, the ratio of private work to public work is better balanced than at any time so far this year. Fresh inquiries, at 36,000 tons, are by far the best of the year. A coal and ore dock in Michigan will take 15,000 tons and a number of Mid-Western States are in the market with bridge programs that call for 600 to 1000 tons each. Dredges and pontoons for work on the Missouri River call for 1500 tons of steel and miscellaneous small jobs of less than 100 tons each total 1300 tons. Erection crews for the San Francisco-Oakland bridge are being sent to the West Coast in preparation for an early start on erecting steel.

Coke

Foundry coke shipments for the first half of February are fully double the movement in the first 15 days of January. Current prices are strong and cover deliveries only to the end of this month.

Scrap

This market is following rather a listless course. Prices are still inclined to move upward but lack of buying and some distress tonnage are holding back dealers. Consumers are purchasing cautiously and usually in small lots, thereby holding prices to rather an even level. If dealers' opinions reflect the true situation, there would be needed only some large tonnage inquiry to drive prices at least 50c. a ton higher. Acceptances by steel mills are still low and it is evident that both their stock piles and commitments made at lower prices help them hold a strong position at this time. Some mills' stocks and commitments are said to be the largest in three years. The Chicago & Eastern Illinois is offering a small list.

Steel Bookings Expand In New York District

Sharp Rise in Tin Plate Releases Is Coupled With Gain in Sheet and Strip Business—Railroad Tonnage Impends

NEW YORK, Feb. 13.—A sharp rise in tin plate bookings and a gain in sheet and strip specifications have further bolstered the position of producers of light-rolled products. Can makers have released tin plate orders equal to at least one month's allotment after having been virtually out of the market since the first of the year. Considering their unusually heavy specifications against old contracts in December, their return to the market at such an early date was surprising. Whether they fear labor difficulties in the mills later in the year or their consumption has been expanded through the growth of new uses for cans is not definitely known. Possibly both factors have contributed to the increase in their specifications.

The gain in sheet and strip business is accounted for by a larger number of orders from miscellaneous consumers. The need for stock replenishment, expansion of requirements and the sold-up condition of many mills have all played a part in driving in orders. Fear of price advances is also doubtless a factor, although less is heard of possible increases than a week or two ago. Nevertheless some buyers, although by no means all of them, are aware that the code does not require mills to give their customers 10 days in which to cover prior to an advance. Mills are only required to file their minimum prices with the American Iron and Steel Institute and may charge higher prices on any or all of their business at any time that they choose to do so. Moreover, in case the mills file formal advances for second quarter 10 days before March 1, there would be no opportunity for a buyer to cover at the old prices, since no quarterly business can be closed sooner than one month prior to the quarter. Buyers, of course, could place orders in the intervening period for March shipment, but mills would not be required to accept the business and, in case they were already fully booked, could not accept it.

Export business, particularly in tin plate, is still active. Tonnage in heavy rolled products will soon be placed by car builders and locomotive shops in this territory that participated in the Van Sweringen and the Lehigh & New England orders. The New York Central has not yet readvertised for the 11,000 tons of steel on which bids were recently rejected. Meanwhile, the American Iron and Steel Institute is obtaining mileages from the carriers to compute tariff allowances in quoting on railroad business. This work, which may take a month or more, will eliminate the confusion that has arisen in connection with railroad lettings.

Pig Iron

This district is practically devoid of important inquiry, and selling is still confined to scattered carlots of prompt and March iron. Bookings for the past seven-day period approximated 2000 tons, compared with 2500 tons in the preceding week, and 3200 tons sold two weeks ago. Aggregate melt of foundries has not improved, but blast furnace representatives expect more interest in new commitments within the next month. At that time yard stocks will need replenishing, and present railroad car and machinery orders will have reached foundry order books.

Reinforcing Steel

The recent inclement weather stopped construction on most public works projects in this district, and hence sellers have been unable to dispose of any sizable tonnage of mesh or bars. American Steel & Wire Co. will furnish 250 tons of road mesh for work in Saratoga County, N. Y., and distributers booked a few small tonnages of bars for local private projects. General contractors for State roads and structures in New York and New Jersey are expected soon to announce awards aggregating about 600 tons, and Frederick Snare Corpn., New York, will shortly sublet 1700 tons required by a State bridge at Cambridge, Md.

Scrap

The market in this district is currently quiet, but sellers expect the present steady improvement in mill activity soon to be reflected in a stronger scrap market. Bethlehem is buying in moderate quantities here, whereas other large mills supplied by this district are temporarily uninterested in new commitments. All brokers' prices are unchanged and fairly firm as a result of the steady purchases against export contracts. Consumers in England have placed several good orders, and loadings for Italy, Poland and Japan are comparatively satisfactory. In addition, local brokers are receiving inquiries from melters in Spain and several South American countries.

Steel Foundry Buys Scrap at St. Louis

ST. LOUIS, Feb. 13.—The Commonwealth division of the General Steel Castings Co., which was shut down in September, 1931, will open about April 1, employing about 1000 men, according to instructions received here by Earl Varnum, assistant general manager, from headquarters at Eddystone, Pa. The company is said to have placed orders during the week for approximately 5000 tons of scrap, mostly No. 1 railroad heavy melting steel, for delivery during February and March to supplement the stock it had on hand. The scrap market continues strong, with advances in several items of 25c. to $1 a ton. Railroad lists: Chicago & Eastern Illinois, 1000 tons; Missouri Pacific, 97 carloads, and Pullman Co. (St. Louis), 10 carloads.

The State of Illinois has opened bids on large quantities of fence posts, barbed wire fencing and staples. The code has helped the general situation on wire products by clarifying the resale price for jobbers. The reduction in the price of hot-rolled strips from 1.85c. to 1.80c., Chicago, effective Feb. 15, has slowed up purchases until the lower price becomes effective. With this exception, there has been a nice pickup in steel inquiries during the week. The State of Kansas has awarded 975 tons of structural steel to the Kansas City Structural Steel Co. and 701 tons to the St. Joseph Structural Steel Co. for highway bridges.

A railroad centering here has asked steel mills for prices on rails and track accessories if, as and when a Federal loan is negotiated, but subject to cancellation if the loan is not negotiated.

Shipments of pig iron show some increase, but buying continues light, although the melt in the district is improving.

Advance in Scheduled Steel Operating Rate

The operating rate of the steel industry for the week beginning Feb. 12 was 39.9 per cent as compared with 37.5 per cent last week, according to the American Iron and Steel Institute.

Railroad Tonnage Still Pending at Philadelphia

Pennsylvania Railroad's Purchases Will Include 9000 Tons of Poles for Electrification Project—Steel Output Rises to 26 Per Cent

PHILADELPHIA, Feb. 13.—The only large tonnages before the market in this district are requirements of the Pennsylvania Railroad for 6500 freight cars and electrification work between New York and Washington. Resumption of the electrification work will result in early releases of steel already placed, a great deal of which has not been rolled. Among lettings pending are between 8000 and 9000 tons for poles and structural material for substations.

The past week has been quiet except for some fair-sized lots of full-finished sheets which have been booked. Mills are filled to capacity for the rest of the quarter on these grades, booked by automotive consumers.

PWA work still is almost entirely absent from mills but this class of tonnage, together with additional railroad buying, is expected to prove a substantial stimulus by early March. The Government-financed projects and automotive buying, however, reflect the only important business that promises to develop soon.

Two additional open-hearth furnaces have been added to the active list of the past week, bringing operations up two points to 26 per cent of capacity. Unless there is a pickup in business there will be a slight recession before the week-end, inasmuch as one maker will otherwise take off one furnace.

Pig Iron

Slight improvement has developed in pig iron sales. Lots ranging from 300 to 400 tons down to carloads of foundry grades have been booked. The cold snap has stepped up operations of stove makers and resulted in a moderate increase in pig iron requirements. While cast iron pipe makers are operating at a good rate, they still have fair-sized stocks of iron on hand, with the result that they are not actively in the market. Royal Dutch iron is reported to be selling at about 50c. per ton in small lots and $1 per ton in large lots under the price of domestic iron. Shipments are holding up well.

Plates, Shapes and Bars

Fabricators are expecting early releases of orders and placing of new requirements in connection with electrification work which the Pennsylvania Railroad has resumed. It is estimated that from 8000 to 9000 tons of poles will be required to complete the work between Wilmington, Del., and Washington. Tonnages also will be placed for substations and tunnels in Baltimore and Washington. The Pennsylvania's program for 6500 cars to be built at Altoona, Pitcairn and Enola, Pa., will call for total steel requirements estimated at around 80,000 tons, though bids were taken on only 22,350 tons of structural material and sheets, together with 18,000 wheels and 3000 axles. Steel for the Philadelphia-Camden bridge and subway project will call for a fair-sized tonnage. Included in it is 1540 tons of structural material for the Philadelphia approach, and formal award of this work to the McClintic-Marshall Corpn. is expected to be made soon by the Delaware Joint Commission. The Camden approach will require about 2400 tons of structural steel and a round tonnage of sheet piling. Other tonnages will be let for the foundation and track work.

Sheets

Mills in this section are fully engaged for the remainder of the quarter on full-finished sizes. While the bulk of the requirements are for automotive consumers, there also have been sizable bookings from steel furniture manufacturers. The demand of automotive makers has developed a strain on wide sheets and it is reported that two nearby mills are thinking of building units for these grades. It is also reported that consideration is being given by an eastern Pennsylvania mill for the construction of a continuous strip mill. Bookings of galvanized sheets are fair, the principal requirements being for jobbers. Ice can manufacturers also have been active buyers.

Imports

The following iron and steel products were received here last week: 400 tons of ferromanganese from Norway; 125 tons of steel tubes, 72 tons of steel rods, 33 tons of steel bars and 18 tons of steel forgings from Sweden, and 20 tons of structural shapes, 13 tons of steel bars and 3 tons of steel bands from Belgium.

Warehouse Business

Jobbers' business has shown mild activity in miscellaneous lines, with the greatest movement in corrugated sheets. Prices remain unchanged.

Scrap

The market is comparatively quiet but remains firm. The only sales reported covered couplers and knuckles and rolled steel wheels which went at $15, an increase of 50c. over the quoted market. While no sales of No. 1 heavy low phosphorous have been made recently this grade has moved up sympathetically to a range of $15 to $15.50.

Sheet Demand Active At Cincinnati

CINCINNATI, Feb. 13.—The sheet market continues to be a bright spot in this area, with demand holding to the high level of 90 per cent of capacity. Automobile manufacturers are accounting for the bulk of current orders, although miscellaneous business has reached an encouraging level. Mill operators, however, expect a tapering of automotive demand after dealers are supplied with new models. The light gage departments of the leading district interest are operating at full capacity and the indications are that they will continue to do so throughout the quarter. Heavy gage departments, however, are still on low schedules. With a large number of users covered for the remainder of the quarter, the possibility of price increases before second quarter are remote.

Pig Iron

Current business is in small quantities and bookings for the week do not total more than 300 tons. Melters are carrying substantial inventories from December, which are not being reduced at a sufficiently rapid rate to presage any early need for more iron. Foundries have expanded the melt conservatively and some small improvement is noted in the machine tool demand.

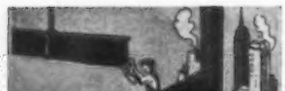
Coke

Shipments of foundry grades of coke continue to be heavy. New business is confined to 30-day commitments.

Scrap

With mills carrying substantial inventories of scrap, new business is small. Dealers are buying in small quantities for contracts and for yard accumulations, but the activity is without market influence.

Operations Rise Five Points To 63 Per Cent at Cleveland



Specifications from Automobile Industry Are Large—Sheet Mills Heavily Booked—Some Finishes of Sheets May Advance

CLEVELAND, Feb. 13.—The heavy demand from the automotive industry continues to be the outstanding feature of the finished steel market. While the receipt of contracts for sheets from that source subsided somewhat during the week following the purchases of large tonnages, heavy specifications were issued against outstanding orders.

Consumers in the automotive field for the most part are reported to have covered for their sheet and strip requirements for the remainder of the current quarter and they are getting in their specifications to make sure of deliveries by March 31, the deadline date for shipments against first quarter contracts. They are being urged to do this by some of the sheet producers who see danger of such an inflow of orders later that they will be unable to ship all the tonnage specified before the end of March. Some of the sheet mills are now well filled for the remainder of the quarter, particularly for the sheets in the higher finishes, provided all the contract tonnage is specified. Hence they are anxious to know how much steel covered by contracts is not to be taken out so that they may determine the additional tonnage they can safely take on in current orders and ship before the end of the quarter.

None of the 175,000 tons of railroad steel for the cars for the Van Sweringen railroads will reach the mills this month, as had been expected. It is now stated that the steel purchases for these cars will not be made for about three weeks. These railroads are still negotiating for trucks, brakes and other specialties to go with the cars. The contracts for the cars have not yet been signed and the preparation of detailed specifications for steel by the car companies takes some time.

Spurred up by the increasing demand of the automotive industry, ingot output in the Cleveland-Lorain territory was increased five points to 63 per cent of capacity this week by the addition of one open-hearth furnace by each of the local mills. Sheet mills in this territory are operating at near capacity. Much interest is being shown in second quarter prices on sheet and strip steel, and advances are looked for on some finishes of sheets. There seems to be more uncertainty about possible advances on strip.

Pig Iron

Shipping orders continue to show an improvement. A leading producer has shipped 35 per cent more iron this month than during the corresponding period in January. The greater part of the iron is going to the automotive industry. Malleable foundries making automobile castings have become quite busy. Orders from the stove industry have picked up. New business is holding around the recent levels. A leading interest sold 4000 tons during the week. Cars recently purchased by the Van Sweringen railroads will require a large tonnage of malleable and steel castings, but orders for these are not expected to be placed for 30 days. One producer is now quoting prices on Southern foundry iron only subject to immediate acceptance.

Sheets

New business from the automotive industry declined somewhat during the week, following the placing of large tonnages during the previous few weeks. However, specifications increased. Contract customers have been warned by some of the mills that they must get in their specifications promptly to make sure that they will secure delivery against all their orders by March 31. One leading producer asked its customers to have all first quarter specifications in by Feb. 10. Receipt of these specifications will enable producers to know how much additional tonnage in current orders they can take on for the remainder of the quarter. Some new business has come from the steel barrel industry, and a seasonal demand has developed for galvanized sheets for fabrication for building work.

Strip Steel

Hot-rolled strip is in heavy demand from automotive plants and from cold-rolling mills, which are crowding hot mills for shipment. Demand for cold-rolled strip has expanded. New contracts for good tonnages in both hot and cold-rolled material were placed during the week by some of the leading makers of automobile parts, covering their requirements for the remainder of the quarter. The $1 a ton reduction on hot-rolled strip in Chicago was not received with favor by some consumers in this territory, who would like to obtain some price concession by having Cleveland made a basing point.

Bars, Plates and Shapes

Demand for steel bars, largely from forge shops for automotive work, has increased sharply. Alloy steel bars have also become fairly active. Some business now is coming from the agricultural implement manufacturers. The Ohio State highway department is placing 150 tons of reinforcing bars for several road jobs and pending CWA work is expected to require 500 tons. Several new construction jobs, state bridges and other public works, requiring 900 tons of structural steel, have come out.

Bolts, Nuts and Rivets

There is a heavy demand for bolts and nuts from the automotive industry and a slight increase in business from railroads. Demand from miscellaneous consumers and from jobbers continues light. Recent car orders will bring out a good volume of orders both for bolts and nuts and for rivets.

Iron Ore

Shipments of Lake Superior ore from Lake Erie docks during January amounted to 81,864 tons, as compared with 31,144 tons during January last year. The dock balance Feb. 1 was 5,246,278 tons, as compared with 5,131,577 tons on Feb. 1, 1933.

Scrap

The local market has been stiffened by the purchase of 20,000 tons of railroad grade heavy melting steel scrap and compressed sheet steel scrap by a Lorain mill at $13.50 for the former and $12.50 for the latter. A local mill during the week bought a small tonnage of machine shop turnings at $9 and, with present increased operations, is expected to make additional purchases. Other mills are taking liberal shipments against outstanding contracts. Prices have advanced 25c. a ton on heavy melting steel and some other steel making grades, and it is expected that blast furnace scrap will be marked up when consumers make new purchases.

Fabricating Plant to Be Built Near Weirton

ERECTION of a steel fabricating plant at Hollidays Cove, W. Va., adjacent to the property of the Weirton Steel Co., is promised in an announcement by J. C. Williams, president of the Weirton company. The name of the builder of the plant was not divulged, although it is believed to be a large independent fabricating company in the Pittsburgh district. According to Mr. Williams, the construction contract for the buildings will be let within 60 days.

Valley Ingot Rate Approaches 50 Per Cent as Steel Bookings Mount

YOUNGSTOWN, Feb. 13.—The steel industry in the Valleys continues to show marked improvement. While business gains in the latter part of January were largely traceable to the automobile industry, February has brought impetus to many other important consuming lines and automotive buyers have further increased their requirements. Recent railroad car orders have brought business to a large maker of freight car doors which has been inactive for many months. Sheets for car roofing have been placed and producers of plates in the district have taken their share of the recent business. Pressed metal plants are much more active than they were, with demand improving for washing machines, electric refrigerators and kitchen equipment. Stainless and alloy steel is moving in considerably better volume than was the case in January.

Steel ingot production in the district is rapidly approaching the 50 per cent level. Finishing mill schedules on sheets and strip steel are at an even higher rate, although bar and pipe production is still lagging. Blast furnace operations are unchanged, but all the iron now being produced is going directly into the open-hearth furnaces and Bessemer converters.

Of particular importance this month has been the resumption of considerable sheet-making capacity which has been idle for more than two years. The bulge in production last summer was taken care of with an engagement of only about 60 per cent of the industry's sheet-making capacity, but the expectation of business this spring has brought about the fitting out of additional facilities which were not needed then. Increased prices are partially responsible for the reopening of certain mills, but volume is the chief reason. Strip mill activity is equally strong in the district and is well distributed among the large and small makers.

While aggregate movement of tubular goods shows slight improvement, no specific line is particularly active. Demand for standard pipe is just about holding its own and sizable line pipe projects are lacking. Oil country goods are moving at a slightly better rate. Lap-weld mills in the territory are generally inactive, with seamless capacity engaged at a relatively good rate. Electric weld units are running two or three days a week.

With less than a week in which to file prices which are to become effective in the second quarter, sellers of sheet and strip steel are unwilling to commit themselves on the subject of advances. Light cold-rolled and hot-rolled annealed sheets are now selling at levels which are below the cost of production for some makers, but increasing demand will gradually wipe out losses. Consumer opposition to current levels with all extras added is still heard in some quarters, and a reaffirmation of present prices would not be surprising.

The raw materials markets have not shared entirely in the recent steel-making gains. Scrap is strong, although sales at higher levels are not reported. A large purchase of heavy melting steel by a Cleveland district user has established the market here at at least $13.50. Pig iron is very dull.

Operations Taper In South

BIRMINGHAM, Feb. 13.—The past week was a dull one for pig iron, steel and cast-iron pipe. New tonnage was in small lots and demand was light.

There is only a small volume of contract business in pig iron, with most of the foundries already stocked for the first quarter. Current buying is made up largely of spot orders. February shipments are slightly better than those of last month.

Ten blast furnaces are operating, no change having taken place in the last two weeks. The price remains at $13.50.

Stove plants have probably been making a better showing in recent weeks than any other branch of the foundry industry. Demand in the country markets has been better than usual for this time of the year, due largely to CWA money and higher farm prices.

All lines of steel products have been quiet and new tonnage is smaller than has lately been the case. Twelve open-hearth units were worked last week, but this week there will be a reduction to 11.

Rail Distribution Is Feature on Coast

SAN FRANCISCO, Feb. 12.—The Southern Pacific Co., having been granted a loan of $12,000,000 by the Public Works Administration, has purchased a total of 40,000 tons of rails at an estimated cost of $3,051,785. Contracts have been let to the Columbia Steel Co. for 17,600 tons, to the Pacific Coast Steel Corpn. for 8000 tons and to the Colorado Fuel & Iron Products Co. for 14,400 tons. The expenditure of $7,504,450 for repairing of trestles and rolling stock will include an unannounced steel tonnage.

Of the limited number of steel inquiries reported during the week two Federal projects were outstanding. Approximately 2500 tons of structural steel and 300 tons of reinforcing bars are included in the specifications for a heating plant at the Navy Base at Pearl Harbor, T. H. The post building at the Army Air Base at Albrook Field, C. Z., will require 300 tons of steel pipe, 250 tons of plates and 200 tons of reinforcing bars. New projects reported during the week aggregated but 2187 tons of structural steel and 1699 tons of reinforcing bars.

Of the week's structural steel bookings 388 tons was placed with Judson-Pacific Co. for a county bridge near Santa Rosa, Cal. At Santa Monica, Cal., the Consolidated Steel Corpn. took 175 tons for an aircraft factory building, while Pacific Iron & Steel Co. was awarded 200 tons for school bracings. Awards of the week totaled 1131 tons of structural and 466 tons of reinforcing bars.

Cold Weather Checks Boston Scrap Movement

BOSTON, Feb. 13.—The United Shoe Machinery Corpn. is reported to have purchased 300 tons of Buffalo pig iron the past week, and other transactions brought aggregate business up to about 1000 tons, most of which was taken by the Mystic Iron Works. Purchases in all instances were for immediate requirements, buying in anticipation of higher prices having evaporated. The market is bare of open inquiries. The New England iron melt shows a slight increase, yet is not more than 35 per cent of rated capacity.

Higher prices for scrap in other sections of the country are not reflected here. Scarcely any scrap was moved in or out of New England the past week because of the exceptionally cold weather. Some of the largest yards did not operate 12 hours in the entire week. Brokers have some orders for material to be consumed in New England and for eastern Pennsylvania delivery via barge, but practically nothing for Pittsburgh district delivery, and export requirements have been filled.

The local civil works administrator, Boston Quartermaster Depot, Army Base, closed bids Feb. 14 on 3000 tons of sheet piling, 125 tons of anchor rods, and sizable lots of bolts, nuts and turn buckles. The Boston & Albany Railroad has bought a tonnage of tie plates and spikes.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

	Soft Steel *Base per Lb.*
F.o.b. Pittsburgh mill	1.75c.
F.o.b. Chicago or Gary	1.80c.
Del'd Philadelphia	2.04c.
Del'd New York	2.08c.
F.o.b. Cleveland	1.80c.
Del'd Detroit	1.90c.
F.o.b. Buffalo	1.85c.
F.o.b. Birmingham	1.90c.
F.o.b. cars dock Pacific ports	2.30c.
F.o.b. cars dock Gulf ports	2.15c.

Rail Steel
(For merchant trade)

F.o.b. Cleveland	1.70c.
F.o.b. Chicago	1.70c.
F.o.b. Gary	1.70c.
F.o.b. Pittsburgh	1.65c.
F.o.b. Buffalo	1.75c.
F.o.b. Birmingham	1.80c.

Billet Steel Reinforcing
(Cut lengths as quoted by distributers)

F.o.b. P'gh mills	1.90c.
F.o.b. Birmingham	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Cleveland	1.95c.
Del'd Detroit	2.05c.
F.o.b. Youngstown	1.95c.
F.o.b. cars dock Pacific ports	2.45c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. Chicago	1.95c.

Rail Steel Reinforcing
(Cut lengths as quoted by distributers)

F.o.b. Pittsburgh	1.75c.
F.o.b. Cleveland	1.80c.
F.o.b. Chicago	1.80c.

Iron

Common iron, f.o.b. Terre Haute, Ind.	1.60c. to 1.75c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	1.89c.
Common iron del'd New York	1.93c.

Steel Car Axles

F.o.b. Pittsburgh	2.50c.
F.o.b. Chicago	2.50c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Birmingham	1.85c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.885c.
F.o.b. Coatesville	1.80c.
F.o.b. Sparrows Point	1.80c.
Del'd New York	1.98c.
F.o.b. dock cars Pacific ports	2.25c.
F.o.b. cars dock, Gulf ports	2.10c.
Wrought iron plates, f.o.b. P'gh	3.00c.

Floor Plates

F.o.b. Pittsburgh	3.20c.
F.o.b. Chicago	3.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.
F.o.b. Buffalo	1.80c.
F.o.b. Bethlehem	1.80c.
Del'd Cleveland	1.885c.
Del'd Philadelphia	1.905c.
Del'd New York	1.9525c.
F.o.b. cars dock, Gulf ports	2.10c.
F.o.b. dock cars Pacific ports (standard)	2.25c.
F.o.b. dock cars Pacific ports (wide flange)	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.00c.
F.o.b. Chicago mill	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base..2.45c. a lb. except at Bethlehem where the price is 2.55c. Delivered price at Detroit is 2.60c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (¼% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.15c.
Bars, Cleveland	2.15c.
Bars, Buffalo	2.20c.
Bars, Detroit	2.30c.
Bars, eastern Michigan	2.35c.
Shafting, ground, f.o.b. mill, 1½ in.	3.40c.
1-3/16 to 1½ in.	2.90c.
1-9/16 to 1⅞ in.	2.75c.
1-15/16 to 2⅞ in.	2.60c.
2-15/16 to 6 in.	2.45c.

* In quantities of 10,000 to 19,000 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.75c.
No. 10, f.o.b. Gary	1.85c.
No. 10, del'd Detroit	1.95c.
No. 10, del'd Phila.	2.04c.
No. 10, f.o.b. Birmingham	1.90c.
No. 10, f.o.b. dock cars Pacific ports	2.42½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.25c.
No. 24, f.o.b. Gary	2.35c.
No. 24, del'd Detroit	2.45c.
No. 24, del'd Phila.	2.54c.
No. 24, f.o.b. Birmingham	2.40c.
No. 24, f.o.b. dock cars Pacific ports	2.95c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.30c.
No. 10 gage, f.o.b. Gary	2.40c.
No. 10 gage, del'd Detroit	2.50c.
No. 10 gage, del'd Phila.	2.59c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.00c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c.
No. 20 gage, f.o.b. Gary	2.85c.
No. 20 gage, del'd Detroit	2.95c.
No. 20 gage, del'd Phila.	3.04c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.45c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Gary	2.95c.
No. 24, del'd Phila.	3.14c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, f.o.b. dock cars Pacific ports	3.55c.
No. 24 Wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.25c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	2.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c.
No. 28, Gary	2.75c.

Tin Plate *Base per Box*

Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.80

Terne Plate
(F.o.b. Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.75c.
All widths up to 24 in., Chicago	1.80c.
All widths up to 24 in., del'd Detroit	1.95c.
Cooperage stock, Pittsburgh	1.85c.
Cooperage stock, Chicago	1.90c.

Cold-Rolled Strips

F.o.b. Pittsburgh	2.40c.
F.o.b. Cleveland	2.40c.
Del'd Chicago	2.68c.
F.o.b. Worcester	2.60c.

Fender Stock

No. 20, Pittsburgh or Cleveland	3.10c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade

	Per Lb.
Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

Extras of 10c. a 100 lb. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. An allowance of $2 a ton is made to jobbers on straight, mixed or joint carloads; $3 a ton is allowed on less-than-carload shipments.

Base per Keg

Standard wire nails	$2.35
Smooth coated nails	2.35
Galvanized nails:	
15 gage and coarser	4.35
16 gage and finer	4.85

Base per 100 Lb.

Smooth annealed wire	$2.35
Smooth galvanized wire	2.70
Polished staples	3.05
Galvanized staples	3.30
Barbed wire, galvanized	2.85
Woven wire fence, base column	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Steel Black	Steel Galv.	Wrought Iron Inches	Wrought Iron Black	Wrought Iron Galv.
⅛	51½	29½	⅛	+91½	+138
¼ to ⅜	57	38½	¼ & ⅜	+1½	+21½
½	62	50½	½	31½	15
¾	65½	55½	¾	36½	20½
1 to 3	67½	58½	1 & 1¼	39½	25½
			1½	43½	28
			2	41½	26

Lap Weld

2	63½	54½	2	37	22½
2½ to 3	66½	57½	2½ to 3½	38	25
3½ to 6	68½	59½	4 to 8	40	28½
7 and 8	67½	57½	9 to 12	38	24½
9 and 10	67	57			
11 and 12	66	56			

Butt Weld, extra strong, plain ends

⅛	48½	33½	⅛	+13	+45½
¼ to ⅜	54½	41½	¼ & ⅜	+2½	+34½
½	60	51	½	32½	17½
¾	64½	55½	¾	37½	22½
1 to 3	66¾	58½	1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	61½	53½	2	40	26
2½ to 3	65½	57½	2½ to 4	45½	33
3½ to 6	69	61	4½ to 6	45	32½
7 and 8	68	58	7 & 8	46	33
9 and 10	67	57	9 to 12	41½	30
11 and 12	66	56			

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	33	1½ in.—1¾ in.	44
2½ in.—2¾ in.	40	2 in.—2¼ in.	13
3 in.	44	2½ in.—2¾ in.	16
3¼ in.—3½ in.	47	3 in.	17
4 in.	49	3¼ in. to 3½ in.	18
4½ in. to 6 in.	42	4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap welded steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload 4 points under base and two fives. Charcoal iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five. Exception: On 1½ to 1¾-in. charcoal iron tubes no supplementary discounts are granted, and the discount for 10,000 lb. to a carload is 4 points under base and for less than 10,000 lb. 8 points under base.

Standard Commercial Seamless Boiler Tubes
Cold-Drawn

1 in.	68	3 in.	38
1¼ to 1½ in.	68	3¼ to 3½ in.	41
1¾ in.	68	4 in.	43
2 to 2¼ in.	27	4½, 5 and 6 in.	36
2½ to 2¾ in.	34		

Hot-Rolled

2 and 2¼ in.	33	3¼ to 3½ in.	47
2½ and 2¾ in.	40	4 in.	49
3 in.	44	4½, 5 and 6 in.	42

In the case of all sizes except 1-in. to 1¾-in. cold-drawn boiler tubes supplementary discounts of two 5 per cents are allowed on carload lots. On quantities up to 10,000 lb. the base discount is reduced 10 points and a supplementary discount of 5 per cent only is allowed. On quantities 10,000 lb. to 24,999 lb. the base discount is reduced 6 points and a supplementary discount of 5 per cent only is allowed. On 25,000 lb. to a carload the base discount is reduced 2 points and supplementary discounts of two 5 per cents are allowed.

On 1 to 1¾-in. cold-drawn boiler tubes, there are no supplementary discounts. On quantities up to 10,000 lb. the base discount is reduced 12 points; on 10,000 lb. to 24,999 lb., it is reduced 8 points; on 25,000 lb. to a carload it is reduced 2 points.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 3.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, 60-lb. and heavier, per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$32.00
Light rails (from rail steel) per gross ton	31.00

	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.40
Spikes, boat and barge	2.40
Tie plates, steel	1.90
Track bolts, to steam railroads	3.55
Track bolts, to jobbers, all sizes (per 100 count)	70 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh.	70, 25 and 10
Stove bolts in packages, Ch'go.	70, 25 and 10
Stove bolts in packages, Cleveland,	70, 25 and 10
Stove bolts in bulk, P'gh	85
Stove bolts in bulk, Chicago	85
Stove bolts in bulk, Cleveland	85
Tire bolts	60

Large Rivets
(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago and Birmingham	2.85

Small Rivets
(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago and Birm'g'm	70 and 10

Cap and Set Screws
(Freight allowed up to but not exceeding 65c. per 180 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screw, 1 in. dia. and smaller	75, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ⅞ in. and smaller	75
Upset hex. head cap screw, U.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Upset set screws cut and oval point	75 and 10
Milled studs	65 and 5

STAINLESS STEEL

(18% Cr. 8% Ni. 0.08 to 0.12% C)
(Base Prices, f.o.b. Pittsburgh)

	Per Lb.
Bars	23c.
Plates	26c.
Sheets	32c.
Hot-rolled strip	20c.
Cold-rolled strip	27c.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Youngstown, Chicago, Gary, Buffalo, Cleveland, Birmingham.

	Per Gross Ton
Rerolling	$26.00
Forging quality	31.00

Delivered Detroit

Rerolling	$29.00
Forging quality	34.00

Sheet Bars

F.o.b. Pittsburgh, Youngstown, Cleveland, Chicago, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open-hearth or Bessemer	$26.00

Skelp

F.o.b. Pittsburgh, Youngstown, Chicago, Buffalo, Coatesville, Pa., or Sparrows Point, Md.

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Pig Iron, Ores, Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$18.50	$19.00	$18.00	$19.50
Bethelehem, Pa.	18.50	19.00	18.00	19.50
Birdsboro, Pa.	18.50	19.00	18.00	19.50
Swedeland, Pa.	18.50	19.00	18.00	19.50
Sparrows Point, Md.	18.50	....	18.00	....
Neville Island, Pa.	18.00	18.00	17.50	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown	17.50	17.50	17.00	18.00
Buffalo	17.50	18.00	16.50	18.50
Erie, Pa.	17.50	18.00	17.00	18.50
Cleveland	17.50	17.50	17.00	18.00
Toledo, Ohio	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
Hamilton, Ohio	17.50	17.50	17.00	18.00
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	....
Duluth, Minn.	18.00	18.00	....	18.50
Birmingham	13.50	....	12.50	....
Provo, Utah	16.50	....	....	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass	$19.00	$19.50	$18.50	$20.00
From Buffalo	19.00	19.50	18.50	20.00
Brooklyn				
From East. Pa. or Buffalo	20.77	21.27	20.27	21.77
Newark or Jersey City, N. J.				
From East. Pa. or Buffalo	19.89	20.39	19.39	20.89
Philadelphia				
From Eastern Pa.	19.26	19.76	18.76	20.26
Cincinnati				
From Hamilton, Ohio	18.51	18.51	18.01	19.01
Canton, Ohio				
From Cleveland and Youngstown	18.76	18.76	....	....
Columbus, Ohio				
From Hamilton, Ohio	19.50	19.50	....	....
Mansfield, Ohio				
From Cleveland and Toledo	19.26	19.26	....	....
Indianapolis				
From Hamilton, Ohio	19.77	19.77	....	....
South Bend, Ind.				
From Chicago	19.55	19.55	....	....
Milwaukee				
From Chicago	18.50	18.50	....	....
St. Paul				
From Duluth	19.44	....	....	....
Davenport, Iowa				
From Chicago	19.26	19.26	....	....
Kansas City				
From Granite City	20.04	20.54	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N.Y. $23.00
Johnson City, Tenn. 23.00
Del'd Chicago 28.65

GRAY FORGE PIG IRON

Valley furnace $17.50

CHARCOAL PIG IRON

Lake Superior furnace $20.50
Delivered Chicago 23.54
Delivered Buffalo 23.78

CANADA

Pig Iron

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75 ..... $21.00
No. 2 fdy., sil. 1.75 to 2.75 ..... 20.50
Malleable 21.00

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75 ..... $22.50
No. 2 fdy., sil. 1.75 to 2.25 ..... 22.00
Malleable 22.50
Basic 22.00

Ferromanganese

Per Gross Ton

Domestic, 80%, seaboard, (carload) $85.00
Domestic, 80%, seaboard, (ton lots) 92.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21% $27.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads) $77.50
50% (ton lots) 85.00
75% (carloads) 126.00
75% (ton lots) 136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid) .. 31.00
14% to 16% (less carloads) 38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6%	$22.25	12%	$29.25
7%	23.25	13%	30.75
8%	24.25	14%	32.25
9%	25.25	15%	33.75
10%	26.25	16%	35.25
11%	27.75	17%	36.75

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10%	$27.25	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Other Ferroalloys

Ferrotungsten, per lb. contained W, del., carloads ..... $1.25 to $1.25
Ferrotungsten, less carloads 1.30 to 1.35
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads ..... 10.00c.
Ferrochromium, 2% carbon ..... 16.50c. to 17.00c.
Ferrochromium, 1% carbon ..... 17.50c. to 18.00c.
Ferrochromium, 0.10% carbon ..... 19.50c. to 20.00c.
Ferrochromium, 0.06% carbon ..... 20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained V ..... $2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace, carload and contract per net ton. $137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage 50.00
Ferrophosphorous, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage 65.00
Ferromolybdenum, per lb. Mo., del. 95c.
Calcium molybdate, per lb. Mo., del. 80c.
Silico spiegel, per ton, f.o.b. furnace, car lots $38.00
Ton lots or less, per ton 45.50
Silico-manganese, gross ton, delivered:
2.50% carbon grade 90.00
2% carbon grade 95.00
1% carbon grade 105.00
Spot prices ..... $5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.5% iron .. $4.80
Old range, non-Bessemer, 51.50% iron 4.65
Mesabi Bessemer, 51.50% iron 4.65
Mesabi, non-Bessemer, 51.50% iron .. 4.50
High phosphorous, 51.50% iron 4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian ..... 9.50c.
Iron, low phos., Swedish, average 63½% iron ..... 9.50c.
Iron, basic or foundry, Swedish, average, 65% iron ..... 9c.
Iron, basic or foundry, Russian, aver. 65% iron ..... 9c.
Manganese, Caucasian, washed 52% 24c.
Manganese, African, Indian, 44-48% ..... 21c.
Manganese, African, Indian, 49-51% ..... 24c.
Manganese, Brazilian, 46 to 48½ .. 20c.

Per Net Ton Unit

Tungsten, Chinese wolframite, duty paid, delivered* $15.00
Tungsten, domestic scheelite, delivered ..... $14.50 to $15.00

Per Gross Ton

Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard $17.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic Seaboard 20.00

*Quotations nominal in absence of sales.

Fluorspar

Per Net Ton

Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines $15.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines 16.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid 18.50
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines 30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel .. $13.50 to $14.00
No. 2 heavy melting steel .. 12.00 to 12.50
No. 2 railroad wrought ... 14.00 to 14.50
Scrap rails ..... 14.00 to 14.50
Rails 3 ft. and under .... 15.00 to 15.50
Sheet bar crops, ordinary .. 14.50 to 15.00
Compressed sheet steel .... 13.00 to 13.50
Hand bundled sheet steel .. 12.00 to 12.50
Hvy. steel axle turnings .. 11.50 to 12.00
Machine shop turnings .... 10.50 to 11.00
Short shov. steel turnings. 10.50 to 11.00
Short mixed borings and turnings ..... 8.00 to 8.50
Cast iron borings ..... 8.00 to 8.50
Cast iron carwheels ..... 13.00 to 13.50
Heavy breakable cast .... 11.50 to 12.00
No. 1 cast ..... 12.00 to 12.50
Railr. knuckles and couplers ..... 15.50 to 16.00
Rail, coil and leaf springs 15.50 to 16.00
Rolled steel wheels ..... 15.50 to 16.00
Low phos. billet crops .... 16.00 to 16.50
Low phos. sheet bar crops. 15.50 to 16.00
Low phos. plate scrap .... 15.00 to 15.50
Low phos. punchings ..... 15.50 to 16.00
Steel car axles ..... 15.50 to 16.00

CHICAGO

Delivered Chicago district consumers:

Per Gross Ton

Heavy melting steel .... $10.50 to $11.00
Shoveling steel ..... 10.50 to 11.00
Hydraulic comp. sheets .. $9.25 to $9.75
Drop forge flashings .... 8.50 to 9.00
No. 1 busheling ..... 9.25 to 9.75
Rolled carwheels ..... 11.75 to 12.25
Railroad tires ..... 11.75 to 12.25
Railroad leaf springs ..... 11.50 to 12.00
Axle turnings ..... 8.75 to 9.25
Steel couplers and knuckles 11.50 to 12.00
Coil springs ..... 12.25 to 12.75
Axle turnings (elec. fur.). 9.25 to 9.75
Low phos. punchings ..... 12.50 to 13.00
Low phos. plates, 12 in. and under ..... 12.50 to 13.00
Cast iron borings ..... 6.50 to 7.00
Short shoveling turnings .. 6.75 to 7.25
Machine shop turnings .... 6.50 to 7.00
Rerolling rails ..... 11.75 to 12.25
Steel rails, less than 3 ft. 12.25 to 12.75
Steel rails, less than 2 ft. 12.75 to 13.25
Angle bars, steel ..... 11.50 to 12.00
Cast iron carwheels ..... 11.25 to 11.75
Railroad malleable ..... 11.75 to 12.25
Agricultural malleable .... 9.25 to 9.75

Per Net Ton

Iron car axles ..... $12.25 to $12.75
Steel car axles ..... 12.00 to 12.50
No. 1 railroad wrought ... 9.25 to 9.75
No. 2 railroad wrought ... 9.25 to 9.75

Wire Rods

(Common soft, base)

Per Gross Ton

Pittsburgh $36.00
Cleveland 36.00
Chicago 37.00
Birmingham 39.00
Youngstown (del'd) 37.00

ALLOY STEEL BLOOMS, BILLETS AND SLABS

F.o.b. Pittsburgh, Chicago, Buffalo, Massillon, Canton or Bethlehem.

Base price, $49 a gross ton except at Bethlehem, where it is $51.

Price del'd Detroit is $52.

CARBON STEEL FORGING INGOTS

F.o.b. Pittsburgh, Youngstown or Chicago.

Uncropped, $28 per gross ton.

COKE, COAL AND FUEL OIL

Coke

Per Net Ton

Furnace, f.o.b. Connellsville Prompt $3.50
Foundry, f.o.b. Connellsville Prompt ..... $4.25 to 5.25
Foundry, by-product, Chicago ovens, for delivery outside switching district 8.50
Foundry, by-product, delivered in Chicago switching district 9.25
Foundry, by-product, New England, delivered 10.50
Foundry, by-product, Newark or Jersey City, del'd .... 8.20 to 8.81
Foundry, by-product, Phila. 9.00
Foundry, by-product, Cleveland delivered 9.27
Foundry, Birmingham 4.75
Foundry, by-product, St. Louis, f.o.b. ovens 8.00
Foundry, by-product, del'd St. Louis 9.00

Coal

Per Net Ton

Mine run steam coal, f.o.b. W. Pa. mines ..... $1.55 to $1.80
Mine run coking coal f.o.b. W. Pa. ..... 1.80 to 2.00
Gas coal, ¾-in. f.o.b. Pa. mines ..... 2.00 to 2.30
Mine run gas coal, f.o.b. Pa. mines ..... 1.80 to 2.20
Steam slack, f.o.b. W. Pa. mines ..... 1.30 to 1.40
Gas slack, f.o.b. W. Pa. mines ..... 1.65 to 1.85

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.

No. 3 distillate ..... 4.00c.
No. 4 industrial ..... 3.50c.

Per Gal f.o.b. Baltimore

No. 3 distillate ..... 4.00c.
No. 4 industrial ..... 3.50c.

Per Gal. del'd Chicago

No. 3 industrial fuel oil ..... 3.73c.
No. 5 industrial fuel oil ..... 3.00c.

Per Gal f.o.b. Cleveland

No. 3 distillate ..... 5.75c.
No. 4 industrial ..... 5.50c.

REFRACTORIES

Fire Clay Brick

Per 1000 f.o.b. Works

	High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	43.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	46.00	40.00

Ground fire clay, per ton 7.00

Chrome Brick

Per Net Ton

Standard size $45.00

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania $45.00
Chicago 54.00
Birmingham 55.00
Silica clay, per ton 8.00

Magnesite Brick

Per Net Ton

Standard sizes, burned, f.o.b. Baltimore and Chester, Pa. $65.00
Unburned, f.o.b. Baltimore 55.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa. 40.00
Domestic, f.o.b. Chewelah, Wash. .. 22.00

CAST IRON PIPE

Per Net Ton

6-in. and larger, del'd Chicago ..... $44.00 to $45.00
4-in., del'd Chicago ..... 47.00 to 48.00
6-in. and larger, del'd New York .. 43.00
4-in., del'd New York 46.00
6-in., and larger, Birmingham, 36.00 to 37.00
4-in. Birmingham ..... 39.00 to 40.00

Class "A" and gas pipe, $3 extra.

No. 2 busheling	$4.00 to	$4.50
Locomotive tires, smooth	9.00 to	9.50
Pipe and flues	5.25 to	5.75
No. 1 machinery cast	9.50 to	10.00
Clean automobile cast	9.00 to	9.50
No. 1 railroad cast	9.00 to	9.50
No. 1 agricultural cast	8.00 to	8.50
Stove plate	7.50 to	8.00
Grate bars	6.50 to	7.00
Brake shoes	8.50 to	9.00

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.50 to	$12.00
No. 2 heavy melting steel	....	9.50
No. 1 railroad wrought	....	11.00
Bundled sheets	....	9.50
Hydraulic compressed, new	9.50 to	10.00
Hydraulic compressed, old	7.00 to	7.50
Machine shop turnings	....	7.50
Heavy axle turnings	10.00 to	10.50
Cast borings	5.50 to	6.00
Heavy breakable cast	11.50 to	12.00
Stove plate (steel works)	....	9.50
No. 1 low phos. heavy	15.00 to	15.50
Couplers and knuckles	14.50 to	15.00
Rolled steel wheels	14.50 to	15.00
No. 1 blast furnace	5.50 to	6.00
Spec. iron and steel pipe	10.00 to	10.50
Shafting	....	16.50
Steel axles	....	14.50
No. 1 forge fire	11.00 to	11.50
Cast iron car wheels	12.50 to	13.00
No. 1 cast	12.00 to	13.00
Cast borings (chem.)	12.00 to	14.00
Steel rails for rolling	....	13.00

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.00 to	$11.50
No. 2 heavy melting steel	10.50 to	11.00
Compressed sheet steel	10.00 to	10.50
Light bundled sheet stampings	6.50 to	7.00
Drop forge flashings	9.50 to	10.00
Machine shop turnings	8.25 to	8.75
Short shoveling turnings	8.50 to	9.00
No. 1 busheling	10.00 to	10.50
Steel axle turnings	8.50 to	9.00
Low phos. billet crops	12.50 to	13.00
Cast iron borings	8.25 to	8.75
Mixed borings and short turnings	8.25 to	8.75
No. 2 busheling	8.25 to	8.75
No. 1 cast	10.50 to	11.00
Railroad grate bars	6.50 to	7.00
Stove plate	7.50 to	8.00
Rails under 3 ft.	14.00 to	14.50
Rails for rolling	14.00 to	14.50
Railroad malleable	11.75 to	12.00
Cast iron carwheels	....	11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	....	$11.00
No. 2 heavy melting scrap	$9.50 to	10.00
Scrap rails	10.50 to	11.00
New hydraul. comp. sheets	9.50 to	10.00
Old hydraul. comp. sheets	6.50 to	7.00
Drop forge flashings	9.50 to	10.00
No. 1 busheling	9.50 to	10.00
Hvy. steel axle turnings	8.50 to	9.00
Machine shop turnings	6.75 to	7.25
Knuckles and couplers	12.00 to	12.50
Coil and leaf springs	12.00 to	12.50
Rolled steel wheels	12.00 to	12.50
Low phos. billet crops	13.50 to	14.00
Short shov. steel turnings	7.50 to	8.00
Short mixed borings and turnings	7.50 to	8.00
Cast iron borings	7.50 to	8.00
No. 2 busheling	6.50 to	7.00
Steel car axles	12.00 to	12.50
Iron axles	11.00 to	12.00
No. 1 machinery cast	12.00 to	13.00
No. 1 cupola cast	11.00 to	11.50
Stove plate	10.00 to	10.50
Steel rails, 3 ft. and under	12.50 to	13.00
Cast iron carwheels	11.00 to	11.50
Industrial malleable	11.50 to	12.00
Railroad malleable	12.00 to	13.00
Chemical borings	9.00 to	10.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	....	$10.00
Scrap steel rails	....	9.00
Short shoveling turnings	....	5.50
Stove plate	$7.00 to	7.50
Steel axles	10.50 to	11.00
Iron axles	10.50 to	11.00
No. 1 railroad wrought	....	7.00
Rails for rolling	....	10.50
No. 1 cast	9.00 to	9.50
Tramcar wheels	9.00 to	9.50
Cast iron borings, chem	....	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$10.50 to	$11.00
No. 1 heavy melting	9.00 to	9.50
No. 2 heavy melting	8.50 to	9.00
No. 1 locomotive tires	9.00 to	9.50
Misc. stand.-sec. rails	11.00 to	11.50
Railroad springs	11.50 to	12.00
Bundled sheets	6.00 to	6.50
No. 2 railroad wrought	9.00 to	9.50
No. 1 busheling	6.50 to	7.00
Cast iron borings and shoveling turnings	5.25 to	5.75
Rails for rolling	12.00 to	12.50
Machine shop turnings	5.25 to	5.75
Heavy turnings	6.00 to	6.50
Steel car axles	10.75 to	11.25
Iron car axles	12.50 to	13.00
Wrot iron bars and trans.	9.75 to	10.25
No. 1 railroad wrought	6.75 to	7.25
Steel rails less than 3 ft.	12.50 to	13.00
Steel angle bars	11.50 to	12.00
Cast iron carwheels	8.50 to	9.00
No. 1 machinery cast	9.00 to	9.50
Railroad malleable	9.00 to	9.50
No. 1 railroad cast	8.50 to	9.00
Stove plate	6.50 to	7.00
Relay rails, 60 lb. and under	16.00 to	16.50
Relay rails 60 lb. and over	$20.00 to	$21.00
Agricult. malleable	9.00 to	9.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$6.50 to	$7.00
Scrap T rails	6.50 to	7.00
Machine shop turnings	3.00 to	3.25
Cast iron borings	4.00 to	4.25
Bundled skeleton, long	4.50 to	5.00
Forge flashings	5.00 to	5.50
Blast furnace scrap	2.75 to	3.00
Shafting	9.50 to	10.00
Steel car axles	9.75 to	10.00
Wrought pipe	4.50 to	4.75
Stove plate	4.50 to	4.75
Cast iron borings, chemical	9.00 to	9.50

Per gross ton delivered consumers' yards:

Textile cast	$10.00 to	$10.50
No. 1 machinery cast	10.00 to	10.50
Railroad malleable	11.00 to	11.50

*Delivered Eastern Pennsylvania points.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.50 to	$9.00
No. 2 heavy melting steel	6.00 to	7.50
Heavy breakable cast	7.50 to	8.00
No. 1 machinery cast	8.00 to	8.50
No. 2 cast	6.50 to	7.00
Stove plate	5.50 to	5.75
Steel car axles	10.50 to	10.75
No. 1 railroad wrought	7.50 to	8.00
No. 1 yard wrought, long	$6.50 to	$7.00
Spec. iron and steel pipe	5.75 to	6.00
Forge fire	5.50 to	6.00
Rails for rerolling	8.00 to	8.50
Short shoveling turnings	3.00 to	3.50
Machine shop turnings	3.50 to	3.75
Cast borings	4.50 to	4.75
No. 1 blast furnace	2.50 to	3.00
Cast borings (chemical)	11.00 to	11.50
Unprepared yard iron and steel	4.50 to	5.00

Per gross ton, delivered local foundries:

No. 1 machinery cast	$11.00
No. 1 hvy. cast (cupola size)	10.00
No. 2 cast	9.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$8.25 to	$9.00
Scrap rails for melting	9.00 to	9.50
Loose sheet clippings	4.75 to	5.25
Bundled sheets	6.00 to	6.50
Cast iron borings	6.00 to	6.50
Machine shop turnings	5.50 to	6.00
No. 1 busheling	6.50 to	7.00
No. 2 busheling	3.50 to	4.00
Rails for rolling	9.50 to	10.00
No. 1 locomotive tires	9.00 to	9.50
Short rails	11.75 to	12.25
Cast iron carwheels	8.25 to	8.75
No. 1 machinery cast	9.50 to	10.00
No. 1 railroad cast	9.00 to	9.50
Burnt cast	6.50 to	7.00
Stove plate	6.50 to	7.00
Agricultural malleable	8.50 to	9.00
Railroad malleable	9.00 to	9.50

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$9.00 to	$9.50
Borings and short turnings	7.00 to	7.50
Long turnings	6.00 to	6.50
No. 1 machinery cast	10.00 to	10.50
Automotive cast	11.00 to	11.50
Hydraul. comp. sheets	9.50 to	10.00
Stove plate	6.50 to	7.00
New factory busheling	8.00 to	8.50
Old No. 2 busheling	5.50 to	6.00
Sheet clippings	6.50 to	7.00
Flashings	7.75 to	8.25
Low phos. plate scrap	10.00 to	10.50

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails, scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles, wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.05c.
Structural shapes	3.05c.
Soft steel bars and small shapes	2.85c.
Reinforcing steel bars	3.00c.
Cold-finished and screw stock—	
Rounds and hexagons	*3.45c.
Squares and flats	*3.45c.
Hoops and bands, under ¼ in.	3.10c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.70c.
Hot-rolled sheets (No. 10)	2.85c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count,	65 per cent off list.
Machine bolts, 100 count,	65 per cent off list.
Carriage bolts, 100 count,	65 per cent off list.
Nuts, all styles, 100 count,	65 per cent off list.
Large rivets, base per 100 lb.	$3.25
Wire, black, soft ann'l'd, base per 100 lb.	*2.575c.
Wire, galv. soft, base per 100 lb.	*2.925c.
Common wire nails, per keg	*2.557c.
Cement coated nails, per keg	*2.557c.

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

*Delivered in Pittsburgh switching district.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	2.90c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.40c.
Flats and squares	3.40c.
Bands, 3/16 in. (in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.20c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.30c.
Hot-rolled sheets (No. 10)	2.85c.
Spikes (9/16 'n. and lighter)	3.50c.
Track bolts	4.65c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3.10c.
	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Coach and lag screws	60 and 5
Hot-pressed nuts, sq., tap. or blank	60 and 5
Hot-pressed nuts, hex., tap. or blank	60 and 5
Hex. head and cap screws	80
Cup point set screws	70
Flat head bright wood screws	37½ and 10
Spring cotters	50
Stove bolts in full packages	72½
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$5.50 off list
No. 8 black ann'l'd wire per 100 lb.	$3.75
Com. wire nails, base per keg	2.70c.
Cement c't'd nails, base per keg	2.70c.

NEW YORK

	Base per Lb.
Plates	3.30c.
Structural shapes	3.27c.
Soft steel bars, small shapes	3.17c.
Iron bars	3.24c.
Iron bars, swed. charcoal	6.50 to 7.00c.
Cold-fin. shafting and screw stock; Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-roll. strip, soft and quarter hard	4.00c.
Hoops	3.42c.
Bands	3.42c.
Hot-rolled sheets (No. 10)	3.17c.
Hot-rolled ann'l'd sheets (No. 24*)	3.65c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.30c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel ½ x ½ in. and larger	3.50c.
Smooth finish. 1 to 2½ x ¼ in. and larger	3.75c.
Open hearth spring steel, bases	4.00c. to 10.00c.
Common wire nails, base, per keg	$3.00
	Per Cent
Machine bolt, cut thread:	Off List
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	60
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50
Boiler tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST LOUIS

	Base per Lb.
Plates and struc. shapes	3.34c.
Bars, soft steel or iron	3.14c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Galv. sheets (No. 24)	4.54c.
Hot-rolled sheets (No. 10)	3.19c.
Black corrug. sheets (No. 24)	3.99c.
*Galv. corrug. sheets	4.59c.
Structural rivets	3.59c.
Boiler rivets	3.69c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	60
Machine and carriage bolts, lag screws, fitting up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts	
1000 lb. or over	60
200 to 999 lb.	55 and 5
100 to 199 lb	50 and 5
Less than 100 lb.	50

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	2.75c.
*Structural shapes	2.75c.
*Soft steel bars, small shapes, iron bars (except bands)	2.75c.
‡Reinforc. steel bars, sq. twisted and deformed	2.565c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.30c.
*Steel bands, No. 12 to 3/16 in., incl.	3.05c.
Spring steel	5.00c.
†Hot-rolled annealed sheets (No. 24)	3.40c.
†Galvanized sheets (No. 24)	4.00c.
*Hot-rolled annealed sheets (No. 10)	2.95c.
Diam. pat. floor plates, ¼ in.	4.75c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For 5 tons or more, exclusive of cutting charge.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.21c.
Soft steel bars	2.90c.
Reinforc. steel bars	2.00c. to 2.50c.
Cold-finished steel bars	3.40c.
Flat rolled steel under ¼ in.	3.26c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.76c.
Galvanized sheets (No. 24)	4.36c.
Hot-rolled sheets (No. 10)	3.01c.
Black ann'l'd wire, per 100 lb.	$2.45
No. 9 galv. wire, per 100 lb.	2.80
Com. wire nails, base per keg	2.45

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.30c.
Bars, soft steel or iron	3.10c.
New billet reinforc. bars	3.10c.
Rail steel reinforc. bars	3.10c.
Hoops and bands, 3/16 in. and lighter	3.35c.
Cold-finished bars	3.70c.
Hot-rolled annealed sheets (No. 24)	3.85c.
Galv. sheets (No. 24)	4.45c.
Hot-rolled sheets (No. 10)	3.10c.
Structural rivets	4.00c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.95
Chain, 1-in., per 100 lb.	8.35
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.69
4-in.	41.23
Lap-welded steel boiler tubes, 2-in.	16.42
4-in.	38.31

BUFFALO

	Base per Lb.
Plates	3.27c.
Struc. shapes	3.15c.
Soft steel bars	2.95c.
Reinforcing bars	1.95c.
Cold-fin. flats and sq.	3.35c.
Rounds and hex.	3.25c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	4.00c.
Galv. sheets (No. 24)	4.15c.
Bands	3.32c.
Hoops	3.32c.
Hot-rolled unannealed sheets	3.07c.
Com. wire nails, base per keg	$3.00
Black wire, base per 100 lb.	3.25

BOSTON

	Per Lb.
Beams, channels, angles, tees, zees	3.42c.
H beams and shapes	3.42c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	3.43c.
Floor plates, diamond pattern	5.18c.
Bar and bar shapes (mild steel)	3.25c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.50c. to 4.50c.
Half rounds, half ovals, ovals and bevels	4.50c.
Tire steel	4.50c.
Cold-finished rounds and hexagons	3.70c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.20c.
Blue annealed sheets, No. 10 ga.	3.25c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Galvanized steel sheets, No. 24 ga.	4.60c.
Lead coated sheets, No. 24 ga.	5.65c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates, tank and U.M.	3.50c.	3.40c.	3.40c.
Shapes, standard	3.50c.	3.40c.	3.40c.
Wide-flanged beams and columns	3.70c.	3.60c.	3.60c.
Soft steel bars	3.55c.	3.40c.	3.40c.
Reinforcing bars	3.10c.	3.15c.	3.50c.
Hot-rolled annealed sheets (No. 24)	4.25c.	4.15c.	4.25c.
Hot - rolled sheets (No. 10)	3.75c.	3.65c.	3.65c.
Galv. sheets (No. 24)	4.85c.	4.75c.	4.85c.
Struc. rivets, ½ in. and larger	6.25c.	6.00c.	5.00c.
Cold finished steel Rounds	5.95c.	5.95c.	4.75c.
Squares and hexagons	7.20c.	7.20c.	6.00c.
Flats	7.70c.	7.70c.	7.00c.
Common wire nails —base per keg			
less carload	$3.35	$3.25	$3.45

All items subject to differentials for quantity.

Reinforcing Steel

Awards 1300 Tons—New Projects 5800 Tons

AWARDS

Saratoga County, N. Y., 250 tons, road mesh, to American Steel & Wire Co.

State of Illinois, 200 tons, road work, to Calumet Steel Co.

Burlington, Iowa, 500 tons, Government dam, to Inland Steel Co.

San Bernardino, Cal., 100 tons, Montgomery-Ward building, to an unnamed bidder.

Santa Rosa, Cal., 100 tons, County bridge over Russian River, to J. P. Brennan.

Tulare County, Cal., 120 tons, State paving work, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

Cambridge, Md., 1700 tons, State bridge over Choptank River; Frederick Snare Corpn., New York, general contractor.

Chicago, 700 tons, Sanitary District sewer; Nash Brothers, low bidders on general contract.

Chicago, tonnage being estimated, kitchen for Campbell Soup Co.

Chicago, 1200 tons, section No. 7, Sanitary District sewer.

Bloomington, Ind., tonnage being estimated, waterworks.

Marion, Ind., tonnage being estimated, waterworks.

State of Illinois, tonnage not stated, road work, letting Feb. 20.

Evanston, Ill., tonnage being estimated, underground water tank.

Oak Lawn, Ill., 725 tons, highway bridge.

State of Colorado, 120 tons, highway work in three counties, bids under advisement.

Nogales, Ariz., 105 tons, Federal conduit work, bids under advisement.

State of California, 100 tons, highway work in three counties, bids Feb. 21.

San Diego, 350 tons, brewery, general contract awarded to W. Hartung.

Los Angeles, 150 tons, County Medical Association library, general contract awarded.

State of Oregon, 130 tons, highway work in two counties, bids under advisement.

Pearl Harbor, T. H., 300 tons, heating plant at Navy Base, bids Feb. 28.

Albrook Field, C. Z., 200 tons, post building at Army Air Base, bids under advisement.

Pipe Lines

Oklahoma Western Gas Co., Cushing, Okla., R. M. Tuttle, president, is having surveys made by Ford, Bacon & Davis, Inc., First National Bank Building, Dallas, Tex., and 39 Broadway, New York, for natural gas welded steel pipe line. Cost about $1,474,325.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 27 for 7200 ft. welded steel pipe for Eastern or Western Navy Yards (Schedule 1743).

Keystone Gas Co., Tioga, N. Y., plans steel pipe line system for gas service at Spencer, Barton and vicinity. Cost about $50,000.

Lewistown, Mont., plans steel pipe lines for gas distribution. Fund of $331,418 is being arranged through Federal aid for this and gas plant. Joseph M. Schmidt is city engineer.

Tacoma, Wash., will take bids at once for about 11 miles of 42 to 63-in. steel pipe for main water trunk line in McMillin reservoir district. Fund of $1,000,000 has been arranged through Federal aid.

Southern California Gas Co., Los Angeles, plans natural gas steel pipe line to pumping station of Little Lake Mutual Water Co., near Hemet, Cal.

Eddy County Gas Co., Carlsbad, N. M., let contract for about seven miles of 6½-in. steel pipe to Republic Steel Corpn.

McClintic-Marshall Corpn. is low bidder on 3720 tons of 28-in. welded pipe for a Government project at Fort Peck, Mont.

Colton, Cal., has placed 47,772 ft. of 6, 8 and 10-in. steel pipe with Southern Pipe & Casing Co.

Railroad Equipment

Lehigh & New England has placed tentative orders for 500 freight cars as follows: 250 box cars to Magor Car Corpn., 150 hopper cars to Pressed Steel Car Co., and 100 gondola cars to American Car & Foundry Co.

Koppel Industrial Car & Equipment Co. is low bidder on 20 hopper cars for Alaska Railroad.

Pittsburgh & West Virginia has tentatively awarded three locomotives to Baldwin Locomotive Works.

Milwaukee Road is taking preliminary figures on 30 locomotives.

Boston & Albany has placed 700 tons of tie plates with Carnegie Steel Co. and 100 tons of spikes with Jones & Laughlin Steel Corpn.

RAILS

Chicago & Northwestern has secured PWA loan for purchase of 26,514 tons of rails, 4000 tons of tie plates, 730 tons of spikes, 180 tons of track bolts, 1460 tons of rail joints, and miscellaneous accessories.

Chicago & Eastern Illinois has borrowed $240,000 from PWA for the purchase of 4000 tons of rails and 1000 tons of accessories.

Southern Pacific has divided its recent order for 40,000 tons of rails as follows: 17,600 tons to Columbia Steel Co. (United States Steel Corpn.), 14,400 tons to Colorado Fuel & Iron Co., and 8000 tons to Pacific Coast Steel Corpn. (Bethlehem Steel Corpn.).

Metals Quotations Remain Uncertain as Other Commodity Prices Move Higher

Copper Holds Steadily at 8c. Despite Adverse Pressure From Outside Sources—Lead and Spelter Firm—Tin Remains Quiet

NEW YORK, Feb. 13.—The market for electrolytic copper is again inactive following the good tonnage movement last week. Consumers are displaying considerable caution, and the market is consequently uncertain and untested. Several shaded outside parcels have been ignored, and metal is currently available in large quantities at 8c. a lb., delivered Connecticut Valley, for delivery positions well into the second quarter. The trade is only nominally interested in the latest impasse in codification discussions. Administrator King is seemingly unable to extract any kind of a workable agreement from the variously interested groups. As it is generally held that too many controls and restrictions were being considered, there was no occasion for surprise because of the suggestion that the problems of stock disposal and market prices be temporarily ignored in order that a general code covering labor questions might be adopted. But labor leaders are now opposing the proposed classification of workers, and an early solution is doubtful.

Copper for delivery abroad is still in good demand at a price equivalent to 8.20c. c.i.f. usual Continental base ports. Foreign market observers consider the trend of consumption there as being upward, with England showing the greatest promise of additional expansion. Although tariff-protected United States is primarily a self-contained market, the price abroad continues to move in sympathy with changes here.

Tin

Local importers look for better tin sales in the near future as a result of the recent sharp expansion in tin plate activity, but the current market is utterly featureless with trading limited to sporadic dealer transactions. Prices moved within narrow limits during the week, and Straits and English grades were available late today at 51.65c. a lb., New York. The market in England is also dull with an undertone none too assured, especially with regard to forward positions. A concerted attack on the proposed "buffer" pool has unsettled the price structure somewhat, and first call postings today declined to £225 15s. for spot and £225 12s. 6d. for future standard, and £229 for Straits in the Far East.

Zinc

Prime Western quotations have firmed at 4.40c. a lb., East St. Louis, and 4.75c., New York, on prompt and for delivery through April, despite the unfavorable increase in smelters' stocks during January. The improved market tone is directly traceable to good consumer support and the aggressive price policy of Tri-State ore miners. Last week's sales were in satisfactory volume, but did not compare with the 5000 tons booked in the preceding week. The major influence in the current spelter market is the developments in the oré fields. Cold weather materially reduced mine output last week, but sales again failed to equal the tonnage of concentrates nominally placed in the market. Some smelters badly in need of supplies assumed commitments late last week at $28 a ton, but most concerns showed no disposition to purchase ore at today's firmly established price of $30.

Total January sales of Prime Western for delivery during the month aggregated 5615 tons at an average price of 4.269c. a lb., East St. Louis. Sales for forward delivery increased sharply to 14,095 tons at an average price of 4.277c. Following sharp stock increases in the two preceding months, smelters' stocks of all grades advanced 6400 tons in January as a result of the high production of 32,900 tons.

Lead

Current sales are in sufficient volume to maintain a 4c. price level notwithstanding the unfavorable stock surpluses at refineries. Average daily sales of leading interests generally are sufficient to offset contracted ore intakes. February commitments now total over 21,000 tons, and March is less than 50 per cent booked. Most of the metal now changing hands is destined for immediate consumption, but many users are prone to purchase further ahead as a protection against the possibility that lead prices may react to the general upward trend in non-metallic commodities.

The Week's Prices. Cents Per Pound for Early Delivery

	Feb. 7	Feb. 8	Feb. 9	Feb. 10	Feb. 13
Electrolytic copper, N. Y.*	7.75	7.75	7.75	7.75	7.75
Lake copper, N. Y.	8.00	8.00	8.00	8.00	8.00
Straits tin, Spot, N. Y.	51.37½	51.45	51.60	....	51.65
Zinc, East St. Louis	4.40	4.40	4.40	4.40	4.40
Zinc, New York	4.75	4.75	4.75	4.75	4.75
Lead, St. Louis	3.90	3.90	3.90	3.90	3.90
Lead, New York	4.00	4.00	4.00	4.00	4.00

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98-99 per cent, 22.90c. a lb., delivered; new No. 12, 19.50c. a lb., delivered.
Aluminum, remelt No. 12 (alloy), carload lots delivered, 14.50c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 7.15c. a lb., New York.
Bross ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	53.00c. to 54.00c.
Tin, bar	55.00c. to 56.00c.
Copper, Lake	9.75c. to 10.50c.
Copper, electrolytic	9.50c. to 10.00c.
Copper, castings	9.25c. to 10.25c.
*Copper sheets, hot-rolled	15.00c.
*High brass sheets	13.75c.
*Seamless brass tubes	16.25c.
*Seamless copper tubes	16.25c.
*Brass rods	12.25c.
Zinc, slabs	5.75c. to 6.75c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig	4.75c. to 5.75c.
Lead, bar	5.75c. to 6.75c.
Lead, sheets	7.75c.
Antimony, Asiatic	8.75c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	32.00c. to 33.00c.
Babbitt metal, commercial grade	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	55.50c.
Tin, bar	57.50c.
Copper, Lake	9.00c.
Copper, electrolytic	9.00c.
Copper, castings	8.75c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	5.00c. to 5.25c.
Lead, bar	8.00c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	19.50c.
Babbitt metal, high grade	61.00c.
Solder, ½ and ½	33.25c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.50c.	7.25c.
Copper, hvy. and wire	6.25c.	7.00c.
Copper, light and bottoms	5.25c.	6.25c.
Brass, heavy	3.50c.	4.25c.
Brass, light	3.00c.	3.625c.
Hvy. machine composition	4.75c.	5.625c.
No. 1 yel. brass turnings	4.25c.	5.125c.
No. 1 red brass or compos. turnings	4.25c.	5.25c.
Lead, heavy	3.00c.	3.625c.
Zinc	2.50c.	3.125c.
Cast aluminum	7.75c.	10.00c.
Sheet aluminum	12.00c.	13.50c.

New Prices Filed With Institute

NEW lowest base prices recently filed with the American Iron and Steel Institute are shown in the accompanying tabulation.

Product Classification	Base Price Per Pound	F.O.B. Basing Point
Stainless Steel (Effective Feb. 6)		
Carbon 0.12 per cent		
Chrome 13.0 per cent		
Silicon 1.0 per cent		
Copper 1.0 per cent		
Rerolling billets	11¼c.	Pittsburgh
Hot-rolled strip	16c.	Pittsburgh
Cold-rolled strip	21½c.	Pittsburgh
Ingots	8¼c.	Pittsburgh
High-speed hack saw sheet steel (Effective Feb. 17)	49.5c.	Pittsburgh
Tungsten 18 per cent		
Chrome 4 per cent		
Vanadium 1 per cent		
Tungsten hack saw sheet steel (Effective Feb. 17)	15.25c.	Pittsburgh
Tungsten 1.35 per cent maximum		
High-molybdenum hack saw sheet steel (Effective Feb. 17)	22½c.	Pittsburgh
Cr approximately 4 per cent		
Va approximately 1 per cent		
W approximately 1½ per cent		
Mo approximately 7½ per cent		
Enameling iron sheets (Feb. 8)	3.24c. —No. 20 gage	Gary, Ind.
Pure iron copper alloy galvanized sheets (Feb. 8)	3.74c.—No. 24 gage	Gary, Ind.
Enameling iron sheets (Feb. 8)	2.79c.—No. 10 gage	Gary, Ind.
Pure iron copper alloy sheets, hot-rolled (Feb. 8)	2.39c.—No. 10 gage	Gary, Ind.
Pure iron copper alloy sheets, hot-rolled (Feb. 8)	3.09c.—No. 24 gage	Gary, Ind.
Culvert sheets copper-bearing pure iron (not corrug.) (Feb. 8)	3.487c.—No. 16 gage	Gary, Ind.
Hot-rolled strip iron (Feb. 8)	2.54c.	Chicago
Strip (rail steel) (Feb. 8)	1.65c.	Chicago
Ingot iron billets and slabs (Feb. 8)	$34.90 a gross ton	Cleveland
Armco ingot iron bars (Feb. 8)	$2.185 per 100 lb.	Cleveland
Ingot iron plates, ¼ in. (Feb. 8)	$2.34 per 100 lb.	Gary, Ind.
Bobbin ring wire (Feb. 16)	$4.55 per 100 lb.	Worcester, Mass.
Charcoal iron muck bar semi-finished—defined as a semi-finished iron product rolled from the squeezed or hammered bloom which shall be manufactured by the knobbling charcoal process (Feb. 7)	$53.50 a gross ton	Philadelphia
Puddled iron muck bar, grade "A"—semi-finished—defined as a semi-finished iron bar rolled from the squeezed bloom which shall be manufactured by hand puddling process, using all pig iron and the resultant product to be in accordance with the definition for wrought iron as defined in the A.S.T.M. specification A-81-33 (Feb. 7)	$63.50 a gross ton	Lebanon, Pa.
Double refined wrought iron (Feb. 7)	5c. per lb.	Creighton, Pa.

Changes in Commercial Resolutions

AMONG further changes made in the commercial resolutions under the steel code are the recision of resolution No. 11 and an amendment of resolution No. 29. The latter, like its sister resolution No. 38, was amended to permit mileage allowances to railroads to be extended to third parties acting for the railroads. The amendment to resolution No. 29 became effective Feb. 2, and is as follows:

> Resolved that, effective immediately, the provisions of the resolution adopted by the board of directors Oct. 27, 1933, and known as commercial resolution No. 29, shall apply to any sale of any product by a member of the code to a trustee, mortgagee or lessor for use in the manufacture of equipment to be used by a common carrier by railroad as lessee, mortgagor or beneficial owner thereof where such product is to be delivered on the line of such common carrier by railroad and it is contemplated that such common carrier shall ultimately become the owner of such equipment.

Commercial resolution No. 11, which was rescinded, provided for an exception to the code provision that steel for identified structures be billed at the delivered price at the freight station nearest the job. It stipulated that in cases where published freight tariffs of railroads do not include through rates with the fabrication-in-transit privilege to the station nearest the job, then the place of delivery for the steel (plates, shapes and bars) shall be deemed to be the shop of the fabricator purchasing the material.

Fabricated Structural Steel

Awards Higher—New Projects Again in Good Volume

LETTINGS of structural steel, at 11,650 tons, compare with 9850 tons in the previous week and 18,800 tons two weeks ago. An award of 1400 tons for Ford buildings at the World's Fair, Chicago, was the largest booking reported. New projects of 22,945 tons compare with 19,450 tons last week. The outstanding inquiry is 5000 tons for a bridge superstructure across the Fore River at Quincy, Mass. Illinois highway spans call for 2800 tons, and 2000 tons additional is required for a heating plant at the Naval base, Pearl Harbor, T. H. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Quincy, Mass., 100 tons, Fore River bridge substructure, to Boston Bridge Works, Inc.

White Plains, N. Y., 110 tons, service station, to Levine Iron Works.

Fort Monmouth, N. J., 115 tons, garage and shop, to Lafayette Iron Works.

Long Island Railroad, 290 tons, bridge at Glendale, N. Y., to McClintic-Marshall Corpn.

Rose Point, Pa., 210 tons, State highway bridge, to American Bridge Co.

Middletown, Pa., 235 tons, Army Air depot, to McClintic-Marshall Corpn.

State of Maryland, 255 tons, bridge, to Virginia Bridge & Iron Co.

Washington, 590 tons, lookout towers for Department of Commerce, to McClintic-Marshall Corpn.

SOUTH AND SOUTHWEST

Fort Bragg, N. C., 530 tons, stables, to Carolina Steel & Iron Co.

State of Virginia, 345 tons, James River highway bridge, to Virginia Bridge & Iron Co.

Fort Benning, Ga., 440 tons, bridge over Upatoi Creek, to McClintic-Marshall Corpn.

Thomasville, Ga., 600 tons, mill buildings for B. F. Goodrich Rubber Co., to Virginia Bridge & Iron Co.

St. Albans, W. Va., 1390 tons, bridge over Kanawha River, to McClintic-Marshall Corpn.

Lexington, Ky., 170 tons, distillery building for Pepper Co., to McClintic-Marshall Corpn.

State of Florida, 335 tons, Suwanee River bridge, to Vincennes Bridge Co.

Stillwater, Okla., 200 tons, dormitory, to Capitol Steel & Iron Co., Oklahoma City.

Carville, La., 150 tons, infirmary, to Chester Iron & Foundry Co.

Lamar County, Miss., 100 tons, highway bridge, to Stupp Brothers Bridge & Iron Co.

Marion County, Miss., 120 tons, highway bridge, to Jones & Laughlin Steel Corpn.

CENTRAL STATES

Chicago, 165 tons, cafe at Century of Progress, to an unnamed bidder.

Chicago, 1400 tons, Ford building at Century of Progress, to R. C. Mahon Co.

Alton, Ill., 110 tons, emergency lock, to Midland Structural Steel Co.

Rockford, Mich., 175 tons, conveyor trestle, to Lackawanna Steel Construction Corpn.

Burlington, Iowa, 1420 tons sheet piling, for Government dam, to Inland Steel Co.

Davies County, Mo., 100 tons, highway bridge, to St. Joseph Structural Steel Co.

Kansas City, Kan., 1140 tons, Turkey Creek viaduct, to Kansas City Structural Steel Co.

State of Kansas, 1200 tons, highway bridges: Sumner County, 160 tons; Montgomery County, 145 tons; Ford County, 450 tons; Osage County, 220 tons, all to Kansas City Structural Steel Co.; Bourbon County, 125 tons; Dickinson County, 100 tons, to St. Joseph Structural Steel Co.

WESTERN STATES

Santa Monica, Cal., 200 tons, bracing for school, to Pacific Iron & Steel Co.

Santa Monica, 175 tons, Douglas Aircraft building, to Consolidated Steel Corpn.

San Gabriel, Cal., 290 tons, outlet on Alamitos Bay, to McClintic-Marshall Corpn.

Santa Rosa, Cal., 390 tons, County bridge over Russian River, to Judson-Pacific Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Quincy, Mass., 5000 tons, Fore River bridge superstructure.

Holyoke, Mass., 250 tons, post office.

Salem, Mass., 100 tons, hangar.

Boston, Quartermaster Depot, Army Base, 3000 tons of sheet piling, for CWA; bids closed Feb. 14.

Philadelphia, 1500 tons, alterations to Richmond Station, Philadelphia Electric Co.; bids Feb. 20.

Harriman, N. Y., 330 tons, State highway bridge.

Binghamton, N. Y., 650 tons, courthouse and post office.

Mountain View, N. J., 220 tons, State highway viaduct.

Rising Sun, Md., 280 tons, State highway bridge.

THE SOUTH

State of Virginia, 1825 tons, highway bridges.

Waynesboro, Va., 1550 tons, bridge.

Hampton, Va., 600 tons, Government bridge over Black River; bids Feb. 15.

CENTRAL STATES

Detroit, 820 tons, Woodward Avenue grade separation.

Escanaba, Mich., 1500 tons, coal and ore dock.

State of Ohio, 200 tons, Ross County bridge; bids Feb. 23.

State of Ohio, 125 tons, Marion County bridge; bids Feb. 16.

Dayton, Ohio, 330 tons, static test laboratories for Wright Field; Gillmore-Carmichael-Olson Co., Cleveland, general contractor.

Toledo, 120 tons, school stadium.

Cleveland, 150 tons, architectural work for Parma reservoir.

Cleveland, 200 tons, building for Steel & Tubes, Inc.

Henry, Ill., 1500 tons, highway bridge.

State of Illinois, 2800 tons, highway spans.

State of Minnesota, 1000 tons, highway bridges.

State of Iowa, 725 tons, bridges.

WESTERN STATES

Monte Rio, Cal., 400 tons, bridge.

State of California, 100 tons, highway work in three counties; bids Feb. 21.

Pearl Harbor, T. H., 2000 tons additional, heating plant at Navy Base; bids Feb. 28.

FABRICATED PLATE

AWARDS

Oklahoma City, 200 tons, tanks for Progressive Brewery, to American Tank & Equipment Co.

Escondido, Cal., 163 tons, city pipe line, to Consolidated Steel Corpn.

NEW PROJECTS

Washington, 1500 tons, dredges and pontoons for Missouri River work.

Albrook Field, Canal Zone, 250 tons of plates and 300 tons of pipe, post building at Army Air Base, bids under advisement.

Cast Iron Pipe

United States Pipe & Foundry Co. is low bidder on 23,000 ft. of 8 to 12-in. for Warwick, R. I.

Worcester, Mass., has awarded 21,000 ft. of 4 to 24-in. to R. D. Wood & Co.

Norwalk, Conn., has awarded 6290 ft. of 16-in. to United States Pipe & Foundry Co.

Tazewell, Va., plans 7-mile water trunk line. Cost about $50,000, of which $30,767 has been secured through Federal aid.

Wilton, Ala., plans 19,400 ft. for water system. Cost about $33,000, including 100,000-gal. elevated steel tank and pumping plant. Federal financing is being arranged. John M. Gilfillan & Associates, 617 North Tenth Street, Birmingham, are consulting engineers.

Canadian, Tex., plans water pipe line system. Fund of $31,000 has been secured through Federal aid for this and pumping equipment.

Cook County, Ill., will buy 30,000 ft. of 12-in. for Oak Forest Infirmary.

John Moore, Evanston, Ill., is low bidder on general contract for 900 tons of 24-in. for Wilmette.

Elgin, Ill., closed bids Feb. 13 on 17,000 ft. of 8 to 12-in.

Rib Lake, Wis., plans about 25,000 ft. for water mains. Election will soon be held to vote funds.

International Falls, Minn., plans about 4½ miles of 20-in. for water trunk line. Fund of $230,000 is being arranged, including elevated steel tank and tower and pumping station. Toltz, King & Day, Inc., Pioneer Building, St. Paul, Minn., is consulting engineer.

Eureka, Mont., plans water pipe line system, replacing present lines. Fund of $30,000 is being arranged through Federal aid.

Council Bluffs, Iowa, closed bids Feb. 13 for 1236 tons for water system.

Elk Point, S. D., plans about 9200 ft. of 2 to 6-in. for water system. Buell & Winter, Insurance Exchange Building, Sioux City, Iowa, are consulting engineers.

Orders for Commercial Steel Castings

WASHINGTON, Feb. 13.—Orders for commercial steel castings in December of last year totaled 25,612 tons compared with 25,558 tons in November, while for the year they amounted to 280,231 tons, against 155,837 tons in 1932. Production last December was 23,718 tons, against 24,721 tons the preceding month, and for the year it was 277,678 tons, compared with 175,831 tons in 1932.

British Iron & Steel Make Large Gains in January

LONDON, ENGLAND, Feb. 13.—(*By Cable*)—Production of pig iron in the United Kingdom for Jan. 1934 reached a total of 441,300 tons, a gain of nearly 11 per cent over Dec. 1933 and the highest monthly total in more than two years.

Steel production for Jan. spurted to 711,000 tons, making also a new high for two years.

Monthly totals for 1932 and 1933 are shown in the following table:

	Pig Iron	Steel Ingots
1932		
Jan.	332,400	429,700
Feb.	318,100	480,600
March	335,600	462,800
April	316,900	433,300
May	315,300	416,900
June	311,400	459,300
July	292,600	430,300
Aug.	259,400	361,500
Sept.	260,400	430,300
Oct.	275,600	438,500
Nov.	267,700	473,800
Dec.	284,500	430,400
	3,569,900	5,247,400
1933		
Jan.	286,600	444,400
Feb.	270,800	482,700
March	332,200	577,700
April	324,700	509,600
May	339,900	599,600
June	345,600	568,800
July	343,900	567,500
Aug.	362,700	551,300
Sept.	359,700	669,000
Oct.	373,300	668,300
Nov.	374,900	695,000
Dec.	409,300	668,900
	4,123,600	7,002,800
1934		
Jan.	441,300	711,000

West Coast Steel Men Meet at Del Monte

DEL MONTE, CAL., Feb. 10.—Speaking before the tenth annual conference of the Iron, Steel and Allied Industries of California, W. A. Irvin, president of the United States Steel Corpn., declared, "It is clear that if the steel industry is to be expected to increase employment and maintain the level of wages now in effect more stability must take the place of the destructive conditions created by cut-throat competition of the past." He expressed the belief that greater stability of markets will result from the open price and basing point provisions of the steel code. These do not make for high prices or abolish the possibility of price reductions but are equitable to both the buyer and seller.

Mr. Irvin stated that the leaders of the steel industry have a fuller understanding of their social responsibilities under the code and that they fully subscribe to the principle of collective bargaining. Modern and untrammelled employee representation plans are functioning effectively and are promoting peace in industrial relations. The problem of whether or not codes are to stand or fall, declared the steel executive, depends on whether or not they work out harmoniously to the best interest of all concerned, that is, labor, industry and the public.

In opening the conference, which was called by the State Chamber of Commerce, E. Jungquist reviewed the progress made during the past year by the steel industry of California and pointed out that employment at the close of 1933 had risen to that of 1931 with an average increase of 6½ per cent for the year.

The American Institute of Steel Construction was represented by V. G. Iden, who portrayed the industry's contribution to recovery in the form of improved types of steel with their many new uses. He urged better salesmanship, higher quality and more advertising as the most effective tools today.

Joseph V. Smith, vice-president of Hubbard & Co., speaking on "The New Deal in Merchandising," evaluated modern business ethics and practices now in use.

At the executive meeting E. Jungquist of the Percival Steel & Supply Co., Los Angeles, was reelected chairman and W. W. Glosser, Hubbard & Co., Emeryville, Cal., was elected vice-chairman.

New Haven Gets PWA Funds

WASHINGTON, Feb. 13.—Immediate work on repairing and rebuilding freight and passenger cars and locomotives will be started by the New York, New Haven & Hartford railroad. This was assured when Harold L. Ickes, public works administrator, today mailed a check for $425,000 as the first instalment on a $3,500,000 PWA loan made to the New Haven. This instalment will be spent by March 25. According to the requisition filed by the carrier, $300,000 of this will be expended for materials.

Among the purchases to be made are air-conditioning apparatus for 142 passenger cars and materials for rebuilding and overhauling 649 other passenger train cars, including 100 de luxe passenger cars, 24 diners and 344 baggage cars.

Administrator Ickes now has signed contracts covering $129,168,000 of the $199,607,800 allotted for loans to railroads and the money is beginning to flow out of the Treasury. The Pennsylvania has drawn the first instalment of $6,990,000 on its $77,000,000 loan for building freight cars and completing electrification between Washington and Wilmington, Del.

Administrator Ickes said practically all of the $199,000,000 is to be spent this year and that it will be going out of Washington in rapidly increasing amounts each month until late fall, when the bulk of the money will have been spent.

General Electric in Gas-Burning Heater Field

A LINE of gas-burning furnaces for steam and hot-water heating has been put on the market by the General Electric Co. They supplement an oil furnace introduced a year ago. The gas furnace will be a coordinated unit with burner, boiler, control and all parts inclosed in a single jacket of distinctive appearance. General Electric air-conditioning dealers throughout the country will make the installations. The new furnaces will be manufactured in Cleveland.

PLANT EXPANSION AND EQUIPMENT BUYING

Tool Builders Encouraged As General Business Improves

ALTHOUGH machine tool demand during the past week, except in the automobile industry has been characterized by single tool orders, builders view the present outlook with optimism because of a noticeable gain in the level of industrial activity.

C. S. Stilwell, sales manager of Warner & Swasey Co., commenting upon suddenly improved sentiment in the Middle West, South, Southwest and Pacific sections and the improved level of activity along the Atlantic seaboard, looks for a general stimulation in capital equipment goods buying. His company expects to equal its 1933 output during the first half of 1934.

Cincinnati builders continue to operate on a 30 per cent level. Chicago dealers note a brisk upturn in demand for small tools, following the intimation of price advances.

The formation of an $11,000,000 R.F.C. fund for the purpose of assisting the financing of Russian business in American machinery is regarded as paving the way for considerable additional Russian tool business.

NORTH ATLANTIC

Circle Auto Radiator & Spring Co., 151 West Sixty-eighth Street, New York, has leased building at 505 West Fifty-seventh Street, 25 x 160 ft., for new plant.

Wilbin Instrument Corpn., New York, has been organized by Gustav A. Binz, 149 Harrison Street, East Orange, N. J., and Clement Wells, 112 Nineteenth Street, Jackson Heights, L. I., to manufacture pressure and vacuum instruments and devices.

American Can Co., 230 Park Avenue, New York, has approved plans for one-story branch plant at Austin, Ind., primarily for tin can manufacture for food products. Cost over $50,000 with equipment.

Como Mines Co., 111 Broadway, New York, Charles Oster, president, will develop gold-mining properties near Dayton, Nev., and plans early installation of equipment for drilling, mining, ore-handling, etc. William Joy is superintendent at mines.

Moss Mfg. Co., Inc., Brooklyn, has been organized by Samuel Sandler, 4315 Seagate Avenue, and Harry Hyman, 209 Avenue P, both Brooklyn, to manufacture refrigerating equipment, beer coolers and kindred products.

Procurement Division, Public Works Branch, Treasury Department, Washington, James A. Wetmore, acting supervising architect, asks bids until Feb. 21 for mail-handling equipment for post office annex, New York; also, for complete elevator plant, same building.

Board of Education, Oceanside, N. Y., plans manual training department in new multi-story high school. Cost $385,000. Federal financing is being arranged. W. S. Wilson, Board of Village Trustees, is in charge.

Bio-Klene Antiseptic Speed Razor, Inc., New York, has been organized by S. Theodore Granik, 433 East Fifty-first Stret, New York, and Samuel Spitzbart, 239 Rutledge Street, Brooklyn, to manufacture razors and knives.

American Smelting & Refining Co., 120 Broadway, New York, has leased gold-mining properties of Azurite Gold Co., near Auburn, Wash., and plans installation of mining, ore-handling and other equipment.

Warner-Quinlan Co., 2 Park Avenue, New York, oil products, is considering addition to bulk storage plant at oil refinery at Warners, N. J., including steel tanks and accessories. Cost about $40,000.

St. Clair Oil Burner Corpn., Middletown, N. J., has been organized by Moffat St. Clair and Ralph T. Moon, Conover Lane and State Highway, to manufacture oil burners and oil-burning equipment.

Seeber Brewing Co., 715 Elizabeth Street, Elizabeth, N. J., is considering multi-story addition. Cost over $50,000 with equipment.

Board of Education, Metuchen, N. J., plans manual training department in new multi-story senior high school. Cost $250,000. Federal financing is being arranged.

A. G. Barker, Vincentown, N. J., is at head of project to erect a local distilling plant. Initial unit to cost about $60,000 with equipment.

Philadelphia Storage Battery Co., Ontario and C Streets, Philadelphia, manufacturer of electric storage batteries and parts, has let general contract to Stewart Brothers Co., 3509 North Tenth Street, for one-story addition. Cost about $150,000 with equipment.

Pep Boys, Inc., Broad and Vine Streets, Philadelphia, automobile equipment and supplies, has leased two-story building, 80,000 sq. ft. floor space, at Tenth and Somerville Streets, for new storage and distributing plant.

Depot Quartermaster, Marine Corps, Philadelphia, asks bids until Feb. 20 for 834 doz. hacksaw blades, 27 tool grinders, 160 putty knives, pliers, ice picks, folding rules, crow bars, funnels, files, trimming knives, tinners' shears, coal shovels, butchers' steels, 100 steel wheelbarrows, gasoline blow torches, 600 sprayers, screw-drivers, 4000 lb. steel wool, 4000 lb. barbed fence wire and other supplies (Schedule 314).

Kinsey Distilling Co., Philadelphia, is arranging for stock issue totaling $380,000, part of fund to be used for expansion and development.

NEW ENGLAND

Atlas Distillery Products, Inc., Hartford, Conn., has leased part of building at 14 Sigourney Street, for new rectifying and blending plant.

Spartan Saw Works, Inc., Springfield, Mass., has been organized by Harold F. Strout and Joseph W. McQuillan, 152 Fisk Avenue, to manufacture saws, hack saws and blades, etc. Company will take over organization of same name with local plant.

State Department of Education, State House, Boston, has plans for addition to State normal school, Fitchburg, Mass., for practical art unit. Cost $120,000 with equipment. S. W. Haynes & Associates, 336 Main Street, Fitchburg, are architects.

Great Barrington Fire District, Great Barrington, Mass., will take bids soon for pumping machinery and auxiliary equipment for new pumping station. Fay, Spofford & Thorndike, 44 School Street, Boston, are consulting engineers.

Caloroil Burner Corpn., Hartford, Conn., has been organized by Arthur L. Shipman, Jr., and Charles B. Cook, 76 Westerly Terrace, to manufacture oil burners and oil burning equipment.

Fitchburg, Mass., has tentative plans for a repair shop. Some equipment will be purchased.

BUFFALO DISTRICT

Consolidated Aircraft Corpn., 2050 Elmwood Avenue, Buffalo, has leased additional space in adjoining property, making total of 200,000 sq. ft. space for plant operations. Tonawanda Products Co., Tonawanda, N. Y., a machine and parts division of Consolidated company, will be removed to Elmwood Avenue works, where all machine shops of company will be concentrated for parts production, finishing, etc. Lawrence D. Bell is vice-president and general manager.

Pratt & Letchworth Co., 189 Tonawanda Street, Buffalo, has reopened malleable iron foundry unit, following shutdown for 18 months.

Cayasler Mfg. Corpn., Buffalo, has been organized by Allen A. Case, 113 Hearth Street, and Nicholas Yavicoli, 251 Ludington Street, to manufacture fire-fighting equipment and parts.

Common Council, Lockport, N. Y., is considering new municipal hydroelectric power plant, using water from Niagara River. Cost over $200,000 with equipment. L. A. Harding, Prudential Building, Buffalo, is consulting engineer.

OHIO AND INDIANA

Eaton Mfg. Co., Central Avenue and East Sixty-fifth Street, Cleveland, manufacturer of automobile springs, bumpers, etc., has exercised option to purchase former plant of Alloy Spring & Bumper Co., Jackson, Mich., leased a few months ago. Property comprises about 32 acres improved with buildings of 100,000 sq. ft. floor space, and will be developed as main branch for production of steel bumpers.

Crystal Springs Brewing Co., Cleveland, care of F. J. Hronek, 5208 Harvard Avenue, architect, recently organized, plans call for bids early in March for new brewery, including bottling works, storage and distribution, etc. Cost about $175,000 with machinery.

Ideal Automatic Machine Co., Cleveland, has been organized under direction of Byron D. Kuth and George E. Ehrke, Guarantee Title Building, to manufacture automatic machinery and parts.

Clyde Stove Co., Fremont, Ohio, H. B. Reppetto, president, is planning early removal of New Method Stove Co., Mansfield, Ohio, recently acquired, to Fremont, where operations will be consolidated and production facilities increased.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until Feb. 27 for starter assemblies in lots of 1 to 100 and 1 to 200 units (Circular 252).

Hudepohl Brewing Co., 40 East McMicken Street, Cincinnati, has asked bids on general contract for four-story and basement addition, 56 x 76 ft., for storage and distribution. Cost about $60,000 with equipment. Jacob J. Rueckert, Ingalls Building, is architect.

National Gypsum Co., 111 West Washington Street, Chicago, has acquired metal lath works of Kalman Steel Corpn., at Niles, Ohio, and

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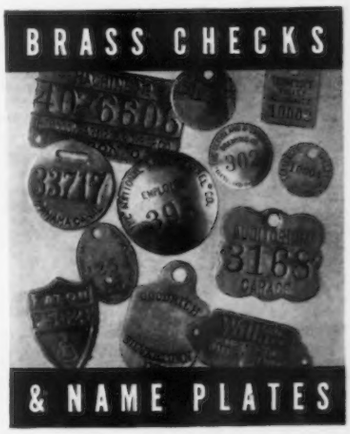

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will develop for new branch works for metal lath and kindred product manufacture.

Construction Service, Veterans' Administration, Washington, asks bids until Feb. 20 for equipment for sewage treatment works at institution at Marion, Ind., including sludge and hot-water circulating pumps, boiler, fuel oil-burning equipment, transformers, tanks, filter equipment, pipe, etc.

American Air Conditioning Corpn., Fort Wayne, Ind., has been organized by C. A. Rodman and J. A. Madera, Fort Wayne, and associates, to manufacture air-conditioning equipment and systems.

SOUTHWEST

Webster Engineering Co., 415 South Peoria Street, Tulsa, Okla., manufacturer of combustion equipment, parts, etc., has leased building at 419 West Second Street, for plant, increasing present capacity. Company is a subsidiary of Surface Combustion Co., Toledo, Ohio.

Common Council, Perry, Mo., has plans for new municipal electric light and power plant, using Diesel engine-generating unit. Cost $63,600 with equipment. Federal financing is being arranged. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are consulting engineers.

United States Engineer Office, Postal Telegraph Building, Kansas City, Mo., asks bids until Feb. 23 for spud frames, sheaves, brackets, etc.

Common Council, Bloomfield, Mo., plans new municipal electric light and power plant. Cost about $56,000 with equipment. Federal financing is being arranged. Conzelman & Co., Title Guarantee Building, St. Louis, are consulting engineers.

Supervising Engineer, United States Indian Irrigation Service, Federal Building, Albuquerque, N. M., asks bids until Feb. 26 for motor-driven pumping machinery, control equipment and accessories for Hogback pumping stations.

Board of Public Works, Topeka, Kan., plans installation of screening machinery, incinerator, conveyors, ash-handling equipment, tanks, etc., for extensions and improvements in municipal sewage disposal plant. Cost about $250,000 with machinery. Federal financing will be arranged. Charles A. Haskins & Co., Finance Building, Kansas City, Mo., are consulting engineers.

City Council, San Angelo, Tex., has plans for new municipal electric light and power plant. Cost about $900,000. Application is being made for Federal aid in that amount. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Red Bluff Water Power Control District, Pecos, Tex., Vernon L. Sullivan, district engineer, has arranged Federal financing for $2,600,000 for new hydroelectric generating plant and irrigation system. Project will include transmission and distributing lines, substations, switching stations, pumping plants, pipe lines, etc.

Model Brass Co., Dallas, Tex., has been organized by Moise Cerf, Dallas, and associates, to manufacture brass, bronze and kindred metal products.

WASHINGTON DISTRICT

Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, plans new main substation for service for electrified lines of Pennsylvania Railroad between Baltimore and Washington. Cost about $1,000,000 with equipment. Company is affiliated with Pennsylvania Water & Power Co. and Safe Harbor Water Power Co., same address, which will carry out expansion in plants and transmission lines for furnishing service noted, to cost $3,000,000 with equipment.

Board of District Commissioners, District Building, Washington, plans manual training department in new Woodrow Wilson senior high school, for which bids on general contract are being asked until March 9. Cost $1,625,000.

Baltimore Steel Drum Co., 1550 Ridgely Street, Baltimore, has been organized by Samuel Klein and Elmer Aaron, Baltimore, to manufacture steel drums and kindred equipment.

Frankfort Distilling Co., Inc., Baltimore, has leased adjoining building at 2104 Boston Street for expansion in blending and rectifying plant. Company has also taken over building at 2327 Boston Street for new storage and distributing unit.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 20 for 14 corrosion-resisting steel gasoline storage tanks (Schedule 1718), plate, sheet and slab zinc (Schedule 1696) for Eastern and Western navy yards.

SOUTH ATLANTIC

Construction Service, Veterans' Administration, Washington, asks bids until Feb. 20 for new cooling tower for refrigerating plant at institution at Oteen, N. C.

Town Council, Central, S. C., plans installation of pumping machinery and auxiliary equipment, pipe lines, etc., for new municipal waterworks. Fund of $62,000 has been secured through Federal aid. Harwood Beebe Co., Spartanburg, S. C., is engineer.

Winston Lead Smelting Co., Winston-Salem, N. C., has been organized by T. S. Douglas, Jr., and G. W. Douglas, 1724 Virginia Road, to operate a lead, zinc and kindred metal works.

American Oil Co., American Building, Baltimore, has filed plans for new bulk oil storage and distributing plant at Winston-Salem, N. C. Cost about $35,000 with equipment. W. C. Miller is manager at Winston-Salem.

MIDDLE WEST

City Council, Clinton, Ill., will ask bids in about 60 days for equipment for sewage disposal works, including pumping machinery and accessories, tanks, fuel oil burning equipment, pipe, etc. Fund of $135,000 has been secured through Federal aid. Pearse, Greeley & Hansen, 6 North Michigan Avenue, Chicago, are consulting engineers.

Rotor Gas Valve Co., 2324 South Canal Street, Chicago, has been organized by K. R. Riedl and associates, to manufacture valves and kindred specialties.

Common Council, Lamoni, Iowa, is arranging fund of $97,000, through Federal aid, for

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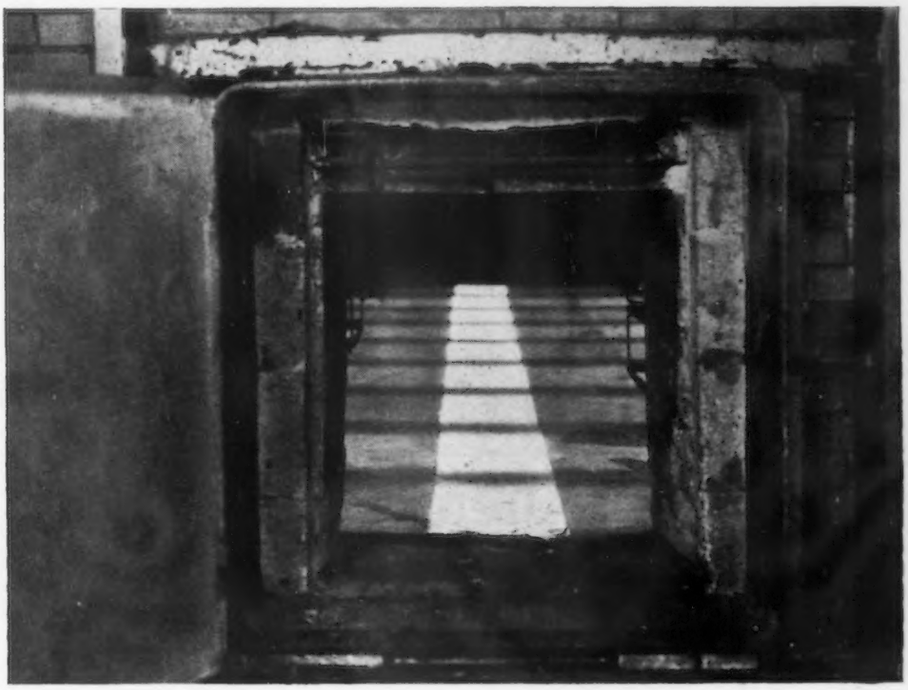

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municipal electric light and power plant, using Diesel engine-generating units. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

Windsor Distilleries, Inc., 2300 East Thirty-first Street, Minneapolis, William A. Boggess, president, is arranging for lease of local building and will remodel for plant. Cost about $60,000 with machinery.

Common Council, Albia, Iowa, has called special election to approve bond issue of $363,880 for new municipal electric light and power plant. Federal financing will be arranged. H. L. Cory, Baum Building, Omaha, Neb., is consulting engineer.

Nebraska Culvert & Mfg. Co., Wahoo, Neb., manufacturer of metal culverts, etc., has leased property at Hastings, Neb., and will soon begin erection of one-story plant, 50 x 65 ft.

City Council, Savanna, Ill., plans installation of pumping machinery and auxiliary equipment, pipe lines, fittings, etc., for extensions and improvements in municipal waterworks. Fund of $72,000 has been secured through Federal aid. Consoer, Older & Quinlan, Inc., 205 West Wacker Drive, Chicago, are engineers.

Schwartz Engineering, Inc., Elkhart Lake, Wis., has been incorporated by Carl Schwartz and associates to manufacture a line of liquid dispensing apparatus. Production plans have not been completed.

Leo G. Smith, 1142 Empire Building, Milwaukee, plans to reenter steel foundry business and is looking for a suitable plant location. He is also in market for equipment.

SOUTH CENTRAL

Louisiana Products Corpn., Winn, near Winnfield, La., W. G. Gray, president, plans new works for production of lime, calcium chloride, sodium sulphate and kindred products. Plant will include power house, machine shop and other structures. Quarrying machinery will be installed at limestone plant for raw material production. Entire project will cost over $500,000 with equipment.

City Council, Fairfield, Ala., is arranging for lease of 100 acres for municipal airport, to include hangars, repair and reconditioning shops, oil storage and distributing plant, and other field units. Cost $91,000, exclusive of hangars and mechanical facilities. Federal financing is being arranged.

Board of Education, Lexington, Ky., plans manual training facilities in new three-story and basement high school addition. Bids will soon be asked on general contract. Cost over $175,000. Warner & Mitchell, Buckley Building, Cleveland, Ohio, are architects.

Bluegrass Brewery, Inc., Winchester, Ky., care of Robert B. Taylor, Lexington, Ky., recently organized with capital of $350,000, has acquired property on East Washington Street, Winchester, and will remodel and equip for initial capacity of about 9000 bbl. a month. Cost over $175,000 with equipment.

Common Council, McEwen, Tenn., plans installation of pumping machinery and auxiliary equipment, pipe lines, fittings, etc., for new municipal water system. Fund of $39,000 has been secured through Federal aid. Freeland Roberts & Co., Independent Building, Nashville, Tenn., are engineers.

MICHIGAN DISTRICT

Lansing Brewing Co., Lansing, Mich., Col. J. C. McCullough, executive vice-president, recently organized with capital of $150,000, has acquired part of former automobile body works of H. J. Hayes Industries, Inc., now in receivership, at North Lansing, and will remodel for new plant. Cost about $90,000 with machinery.

Plymouth Distilleries, Inc., Plymouth, Mich., plans new multi-unit plant. Cost over $75,000 with equipment. Application has been made to Federal Alcohol Control Administration for permission.

Michigan Wheel Co., Grand Rapids, Mich., has been organized by Charles R. Evenson, 516 Seventh Street, N. W., and associates, to manufacture motor boat propellers and other motor boat equipment.

Grand Rapids Brewing Co., Grand Rapids, Mich., G. A. Kusterer, president, recently formed as a reorganization of Furniture City Brewing Co., has taken over former mill of H. M. Reynolds Shingle Co., and will remodel for new plant. Cost about $75,000 with equipment. Mildner & Eisen, Hammond Building, Detroit, are architects.

Dorel Corpn., Detroit, has been organized by Geoffrey M. Johnston, 7200 Melville Avenue, and associates, to manufacture shock absorbers and kindred automotive equipment.

WESTERN PENNA.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, plans one-story addition to plant at Clarksburg, W. Va., for storage and distribution. Cost over $45,000 with equipment.

Kanawha Valley Power Co., 1632 Virginia Avenue, Charleston, W. Va., W. H. Wheelwright, head, has secured permission to erect two hydroelectric generating plants on Kanawha River, near New London and Marmet, W. Va., respectively. Project will include transmission lines, substations, switching stations and other field structures. Cost over $2,000,000 with equipment.

Baldwin Tool Works, Parkersburg, W. Va., has let general contract to Austin Co., Union Trust Building, Pittsburgh, for one-story addition, 60 x 150 ft., to be equipped primarily as forge shop. Cost over $40,000 with equipment.

PACIFIC COAST

Aztec Brewing Co., 2301 Main Street, San Diego, plans addition for storage and distribution, with installation of tanks, refrigerating machinery, conveyors and other equipment. Cost over $200,000 with equipment.

Long Beach High School District, Long Beach, Cal., has plans for new one-story vocational training shop at Woodrow Wilson high school. W. Horace Austin, 532 Chestnut Avenue, is architect.

City Council, Yuma, Cal., is planning new municipal electric light and power distributing system. Cost about $300,000 with equipment. Federal financing will be arranged.

Mupu Citrus Association, Santa Paula, Cal., will take bids soon on general contract for new one-story storage and distributing plant, 32 x 300 ft. Cost about $50,000 with equipment, including conveyors, loaders, etc. C. E. Whipple is secretary and manager.

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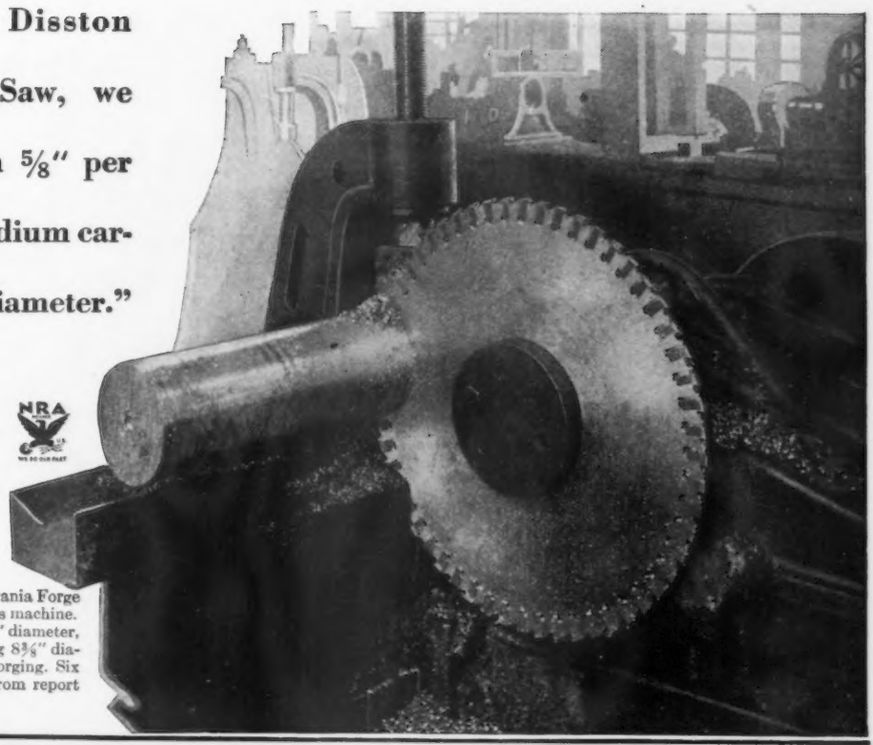

Photograph taken at Works of Pennsylvania Forge Corporation, Philadelphia. Espen-Lucas machine. Disston Improved Interlocked Saw, 32" diameter, 56 teeth, 3/8" blade, 1/2" kerf. Up-cutting 8 3/8" diameter heat-treated steel crank pin forging. Six revolutions per minute. Quotation is from report of C. J. Steen, Engineer.

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Preventing Porosity in Non-Ferrous Castings

(Concluded from Page 30)

many who have studied their troubles call all small-surface pittings of castings, which only show up after being polished, buffed or plated, as due to "porosity." The author feels that to call all such effects porosity is inaccurate.

While oxygen is the principal gas to affect metal, it is not the only gas; hydrogen and nitrogen often affect metal enough to cause scrap, and while extensive research has been made along these lines, the author feels the elimination of evils stated above will be of greatest help to the majority of foundrymen. Some elements are more effective than others.

To reduce the absorption of gases by the metal to a minimum, the author strongly advises starting the melting operation with a reducing (excess fuel) flame until the metal is about half melted, especially if the metal contains considerable metallic oxides. Then neutralize the flame until all the metal is melted. Skim, add final metals to go into the melt, after which operate with an oxidizing (excess air) flame. The slag gives a certain amount of protection to the metal and this type flame will increase the temperature, thereby aiding rapidity of melting, which the author strongly advocates. Also the presence of excess oxygen reduces the solubility of other gases, which otherwise would be dissolved by the copper, and eliminates the most objectionable gas, carbon monoxide, which is insoluble when the metal is solid and results in porous castings.

The author divides so-called porosity into three classes:

1—Occluded steam, H_2O, a mechanical fault.

2—Occluded metallic oxides, a chemical fault.

3—Occluded gases, a mechanical fault, including O_2, SO_2, CO_2 and CO.

Control to eliminate the faults:

To eliminate porosity of Class 1, defects as shown in Figs. 2, 3, 4, 5, 6 and 7, regulate sand moisture, sand grains, and pouring temperature.

To eliminate oxidation of Class 2, defects as shown in Figs. 8 and 9, change grade of metal, metal mixture (i.e., amount of chips, scrap, etc.), method of charging and pouring temperature.

To eliminate gasification, Class 3, defects as shown in Figs. 3, 5, 7 and 13, change method of furnace operation (i.e., air and oil pressure, metal covering, heat temperature, grade of fuel, or pouring temperature.

Based on years of observation, the responsibility for porosity troubles should be charged as follows:

2 per cent to metal storage.
18 per cent to furnace operation.
65 per cent to skimmer.
15 per cent to molder.

United States Steel Corpn. is now distributing an attractive booklet describing various grades of stainless and heat-resisting steels. Various applications of the steels are described and illustrated, and there is included a concise description of the annealing, welding, forming, drawing, riveting, spinning, soldering, and polishing characteristics of the different analysis steels. About half of the booklet is devoted to the metallurgy of stainless steels, and a comprehensive chart lists all the nominal properties of both the stainless and heat-resisting materials.

Potentialities of External Broaching

(*Continued from Page* 19)

⅛ in. The finish was exceptionally good and surfaces perfectly flat.

I have several reports describing the external broaching of steering sectors which have been in regular production for about two years. One installation reported by the Colonial Broach Co. uses a two-spindle Oilgear broaching machine, the other is performed on a Foote-Burt duplex machine. In each case the specifications call for a true helix curve instead of a straight tooth form. To meet this requirement the broaching operation is used for roughing only, the final finishing being done on a gear cutting machine. On the Oilgear installation the roughing cut is approximately 0.370 in. deep and production varies from 300 to 400 pieces per hr.

On the Foote-Burt machine the rough-broaching operation removes 0.410 in. with a production of 600 pieces per hr.

A typical set-up for finish broaching straight-tooth profiles developed by the National Broach & Machine Co. uses a push broach composed of four segments and utilizes a simple form of machine. Actual production is 175 finished pieces per hr., 1200 pieces per grind of the broach. In all three cases the steering sector is a drop forging.

A Related Development

Before passing on to a detailed discussion of applications, I should like to mention in passing another outstanding development, namely, the possibility of broaching cylindrical surfaces. I have in mind the "Relay" method which is to be announced by the Bullard Co. While it may not be termed technically a broaching method, it does provide a segmented cutting tool so constructed as to produce a plow shearing or slicing of the metal chip and pushing it to one side so as to allow the cutting edge to advance with respect to the work. The first form of the Relay cutter was a one-piece cutter of special design for finishing bores. However, the principle may be applied to external cutting.

It may be briefly described as consisting in subjecting the work while rotating at cutting speeds to the action of the tool, the elongated blade edge or edges of which are arranged to approach the work surface (either internal or external), at a major angle with respect to the axis of the work. The cutter blades set on an angle are presented to the work, and the cutter head is moved at a relatively slow speed so that the cutting action passes along the blade axially to the work. This prevents subjection of any one point of the cutter edge to continuous cutting contact with the work, thereby eliminating continuous strain and heat for an excessive time interval.

Cutting Fluids

Since broaching is partly a shearing action, accompanied by considerable liberation of heat, the selection of a suitable cutting fluid is of great importance, particularly in volume production and especially where fine surface finish is desired. These requirements demand a cutting fluid possessing the properties of an efficient refrigerant as well as one with good lubricating and wetting-out properties. I am told that while ordinary cutting compounds are being used with success on the medium steels, where fine finish is desired on low carbon, soft springy steels, a sulfonated cutting fluid with refrigerant properties is recommended.

Large cast iron bodies have been broached dry but a satisfactory coolant for small cast iron parts has been found to be a mixture of paraffin oil and a small quantity of kerosene. This solution is said to work equally well on brass and bronze and produces a fine finish as well as giving long life to the broaches.

In consulting with an important and rather successful producer of cutting oils, I find that his experience indicates the use of the following specifications for general broaching operations where the quality of surface finish is not very important, an oil of a viscosity ranging between 150 to 170 containing not less than 2 per cent sulphur. For fine finish the same material is used with the addition of 10 per cent lard by weight.

Study of General Applications

In general, apart from the constructional features and particular advantages of various broaching machines being offered for the purpose, the most important problem concerns the design of the broach and work-holding fixtures. While both push and pull type of broaches are being used in external broaching, either construction may be used satisfactorily since the broaches are held in

(*Concluded on Page* 76)

substantial carrier bars which are perfectly guided in the fixtures. It is unnecessary to emphasize the need for great rigidity and accurate alinement both of the broach and the work. However, this does not complicate the broaching problem in any way since these elements are considered as a part of the design of the work-holding fixture.

Conclusion

In conclusion, it is safe to say that the art of external or surface broaching has provided production men with an entirely new method of finishing various types of external surfaces of large or small areas. How seriously this method will encroach upon the present methods of performing similar operations is something which must be answered by the future experience with this method as well as the competition of possible refinements in existing methods.

I think it is also safe to conclude that ultimately, as our experience with external broaching broadens and as refinements both in the design of the broach and in commercial broaching machines become available, we shall undoubtedly see a more definite standardization of practice. It is quite conceivable that we shall find that certain types of work lend themselves peculiarly to the broaching method whereas other types of work perhaps will continue to be produced by existing methods or at least refinements of them.

Under existing conditions no manufacturing concern can afford to overlook any method that promises definite advantages in the direction of lower cost or increased productivity or any of the other factors which figure so prominently in automotive production. That this is recognized by all progressive elements in our industry is evident from the present activity and widening scope of applications of external broaching.

Trend Line of Pig Iron Production

(Concluded from Page 21)

trend line, showing the same rate of annual increase in consumption, in the post-war period. Carl Snyder, statistician of the Federal Reserve Bank of New York comments[5] on "this persistent rate of growth" in consumption over periods of 50 to 60 years and on "another astonishing finding as to the effect of the World War. We are accustomed to hear a great deal about the enormous stimulation to industry caused by the war. The truth was, that in practically every line—save perchance copper—exactly the reverse was true. What you get in this growth line that I have been describing is 60 years continuous increase, and then a complete arrest of growth for the next six or seven years, and along until about 1922. Then, singularly, from about 1923 onward to 1929 at least, a return in almost each instance in each group, to this normal, persistent, pre-war rate of growth. . . . "

Lewis B. Lindemuth has shown[6] that there is actually an impending shortage in steel scrap to such a degree that he foresees a compulsory change from present metallurgical practice. This conclusion from so eminent an authority could not escape serious attention but it clashed with the accepted dictum that steel scrap had curbed the production of pig iron. It is evident from the conclusions in this article and as shown in Chart III that the rate of pig iron production has not been curbed, but prior to the present economic cataclysm was tending upward at the same rate as before the war, but from a lower base. The conclusions of Lindemuth agree with the facts of pig iron production when properly interpreted and take on added significance.

It must not be expected that the future trend line of pig iron production will be a continuation of the line G—H. It will start from another and lower base. Whether we should charge this up to the fact that we are still not recovered from the war's influence and effect or whether we should account for it by the present cataclysm, it is too early to determine and in any event it is not germane to this article. The new base point cannot now be forecast but the industry may take a great deal of satisfaction and renewed hope from the fact that there is no reason to expect the new trend line to be other than upward and parallel to the old trend line, unless the new social structure being fashioned for us under the aegis of the NRA results in a fundamental social change in the habits of our people.

[5] "Gold and Silver as Monetary Metals," by Carl Snyder, Mining and Metallurgical Society of America, *Bulletin*, April-May, 1931, pp. 49-67.

[6] "Steel Industry Faces Growing Scrap Shortage," by Lewis B. Lindemuth, THE IRON AGE, June 22, 1933, pp. 988-990.

Prices on Plate Seconds

ADDITIONAL prices on plate seconds, effective Feb. 1, have been filed with the American Iron and Steel Institute as follows: For plate seconds sheared into rectangular shapes in random sizes and gages, no quality guaranteed and no single piece to contain over 35 sq. ft. . . . unassorted sizes and gages, 1.20c. a lb., Coatesville, Pa.; assorted to gage, 1.30c., Coatesville.

Eaton Mfg. Co., has purchased the former plant of Alloy Spring & Bumper Co., Jackson, Mich. Bumpers will be manufactured and about 200 men will be employed.

DEOXIDIZE WITH CALCIUM-SILICON

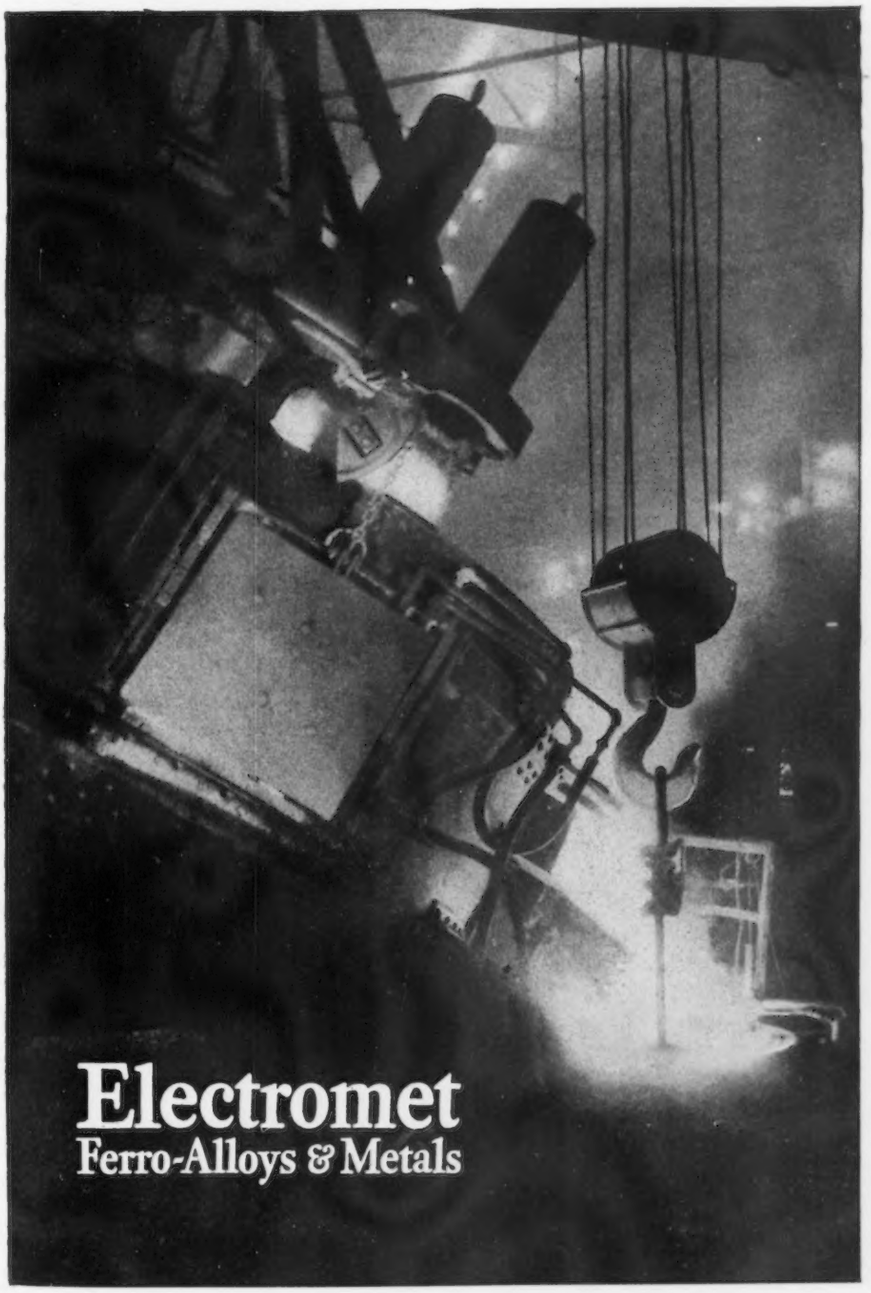
PRODUCT OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

★ Calcium-Silicon is an excellent deoxidizer and scavenger for both steel and cast iron. Both elements of this alloy are active deoxidizers, forming a low melting-point slag which readily cleans the metal of oxides, gases and other non-metallic inclusions.

Calcium-Silicon is also effective in increasing the "life" of the metal, particularly where shanking practice is employed. Steel treated with Calcium-Silicon flows freely right to the end of the pouring period.

Have one of our service engineers call and tell you more about the benefits of Calcium-Silicon treated steel.

ELECTRO METALLURGICAL SALES CORP.
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building, 30 East 42nd Street, New York



CHROMIUM
High Carbon Ferrochrome (maximum 6% carbon)
Low-Carbon Ferrochrome (in grades, maximum 0.06% to maximum 2.00% carbon)
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

SILICON
Ferrosilicon 15% Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 85%
Ferrosilicon 90 to 95%
Refined Silicon (minimum 97% Silicon)
Calcium Silicon
Calcium-Aluminum-Silicon
Calcium-Manganese-Silicon
Silicon-Copper
Miscellaneous Silicon Alloys

TUNGSTEN

MANGANESE
Standard Ferromanganese 78 to 82%
Low-Carbon Ferromanganese
Medium-Carbon Ferromanganese
Manganese Metal
Manganese-Copper
Miscellaneous Manganese Alloys

SILICO-MANGANESE
All grades including Silico-Spiegel

VANADIUM
All Grades

ZIRCONIUM
Aluminum-Zirconium
35 to 40% Zirconium
12 to 15% Zirconium
Zirconium-Manganese-Silicon

BRIQUETS
Chrome Briquets Silicon Briquets
Manganese Briquets

JUST BETWEEN US TWO

He Drew the Blue Prints for the Golden Stairs

WE deny that "amazing" is the most abused word in the English language. Our candidate for the honor is "engineer." A plumber is a sanitary engineer; a fellow who wrote us for a job the other day called himself a publishing engineer. A department store advertised a bed built by a sleep engineer. Seems that all God's chillun are engineers.

But the all-time high is registered by the Michigan repair shop whose letterhead bears the slogan, "Spiritual Engineering." The repair business is just secondary. Their main business, they say, is *"the promotion of righteousness."* They must be kept pretty busy.

Egg Beaters, Jugs, Fly Swatters

IF you can read the names of the following trade associations without grinning, your sense of humor is more refined than ours:

Mechanical Egg Beater Institute
Metal Jacketed Jug Association
Lead Head Nail Mfrs. Association
National Association of Fly Swatter Manufacturers

We didn't make up those names. They're real.

Says E. S. to J. T.

WE wonder if anyone is ever taken in by those phoney inter-office messages some people like to use in their advertising. You know the kind. E. S., the sales manager, writes to J. T., the president, "Our sales for the current quarter beat last quarter by 10 per cent." J. T. marks it coyly, "Great work, E. S.!" and they run it as an ad.

If someone told us to cook up a snappy inter-office memo with an eye toward use as a company ad, we'd write:

"To F. J. From A. H.—Jan. total of new subs was 300, 49% better than Jan., 1933.

Circulation continues to mount steadily. Renewal percentage ditto.

Just checked Aug., 1933, expirations, which is the last month on which complete six month renewal figures are available. And, believe it or not, over 80% are renewed and paid for.
How about a raise?"

The answer would probably be:
"Showing is fair. Considering high quality of IA, renewals should run at least 120%. In re raise, har har!"

Chickenfeed—Only a Tenth of a Billion

UNCLE SAM is planning to set aside $100 millions to finance American goods to be sold to Russia. Soon American manufacturers of equipment and supplies needed by Russia's rapidly expanding metal-working industry are going to have to stencil a lot of shipping cases "U.S.S.R."

With Iron Age aces high in Mr. Stalin's metal-working and metal-producing plants, astute manufacturers will spread the merits of their wares on the closely and widely read pages of this journal. The cost is trifling. Top for a full page is $128, bottom $100, depending on whether you take one or 52.

'Way Down, 'Way Up

THE diving bell Dr. Beebe used in prying into the secret life of those creatures foolish enough to live on the dark, cold floors of the ocean was made by an IA advertiser, the Atlas Steel Casting Co.

The stratosphere gondola in which Lieut-Commander Settle soared 11½ miles above the scene of the recent depression was made by another IA advertiser, The Dow Chemical Co.

That calls for a profound, Brisbanal observation, but we just can't think of anything. Prize for best suggestion: one 1933 calendar, as is.

Three Laurel Wreaths

GOOD headlines are eye-stoppers. These two in Feb. 1 IA stopped us: SKF's "Bearing on Sales," page 8; Wickwire Spencer's "IT—a Vital Wire Characteristic," page 77. A posey to Ludlum Steel, too, for an especially effective presentation of the successful use of the material advertised (Nitralloy), page 3, same issue.

A.H.D.